

DIGBY WELLS

ENVIRONMENTAL

ESG's Role in a Risk-Based Approach to Effective Water Management

Matthew Damhuis

17 October 2024

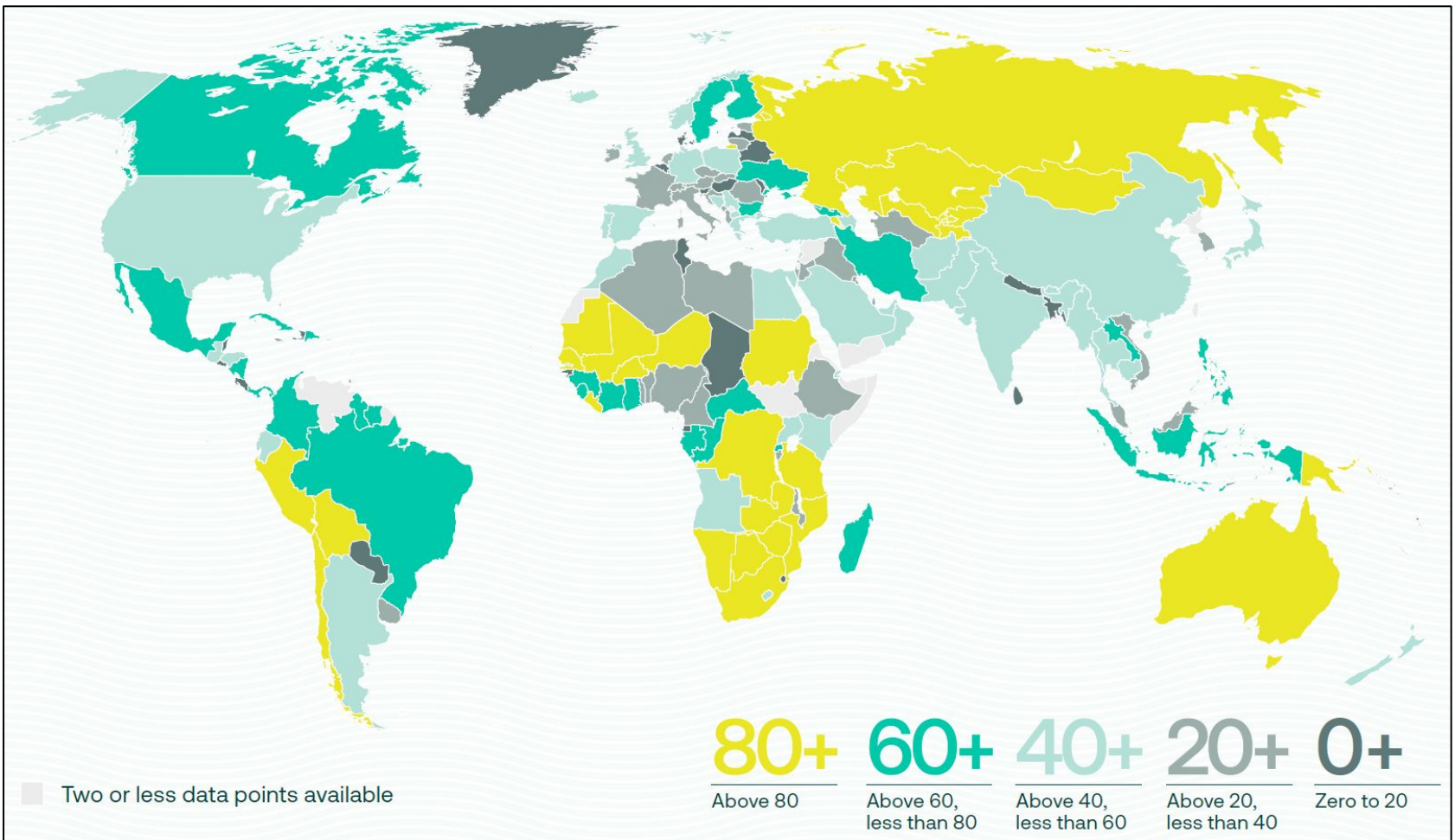
Making A Difference Locally with Global Impact

www.digbywells.com

info@digbywells.com



Mining plays an indispensable role in our modern economy, providing the raw materials we need to develop essential technologies and products that drive society's function and progress. Additionally, mining contributes significantly to social development through job creation, taxes and royalties, as well as corporate social responsibility initiatives within their host communities.



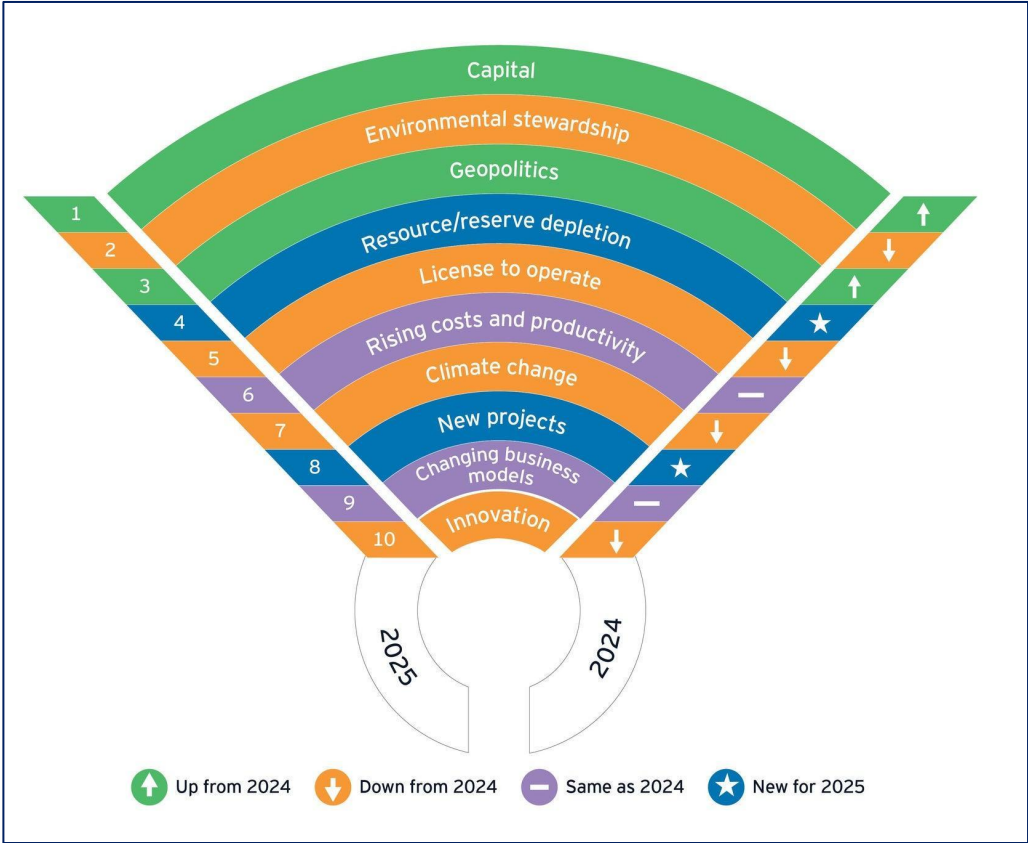
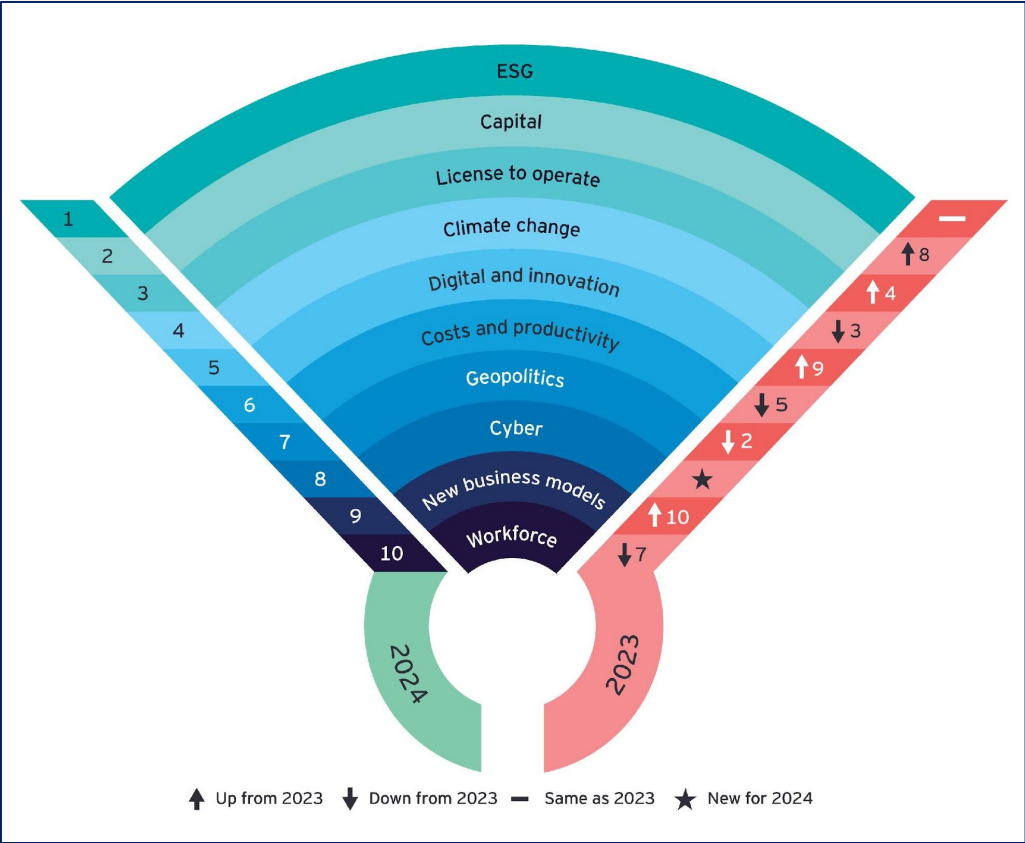
ICMM, 2022



Johnstone-Louis (2024) describes ESG as “the performance criteria through which a company communicates its impacts and dependencies on the environment (E) and society (S)” with the G in ESG referring to “how well a company demonstrates that someone is appropriately responsible for managing corporate opportunities and risks”.

Global interest in ESG performance has been increasing in recent years, with investors and consumers alike using a company’s ESG rating and progress towards its goals in their assessment of the company (Johnstone-Louis, 2024; Kramer & Pfitzer, 2024).

Within the mining industry, ESG and environmental stewardship remain key risks and opportunities, with Ernst & Young (EY) listing these in both their 2024 and 2025 top 10 business risks for mining and metals reports.



According to Kramer & Pfitzer (2024) few companies are making meaningful progress in delivering on their ESG commitments. This lack of delivery on commitments may be due to companies not integrating ESG factors into their internal strategies and operation-level decision making processes (Kramer & Pfitzer, 2024).

The Responsible Mining Index 2022 (RMI, 2022) report recorded the following observation:

“While almost all companies disclose some information on their water management approach, only four companies demonstrate they have systems in place to ensure their operations develop water stewardship strategies and plans, based on a catchment-level approach, to respect the water needs and rights of current and future water users and the environment.

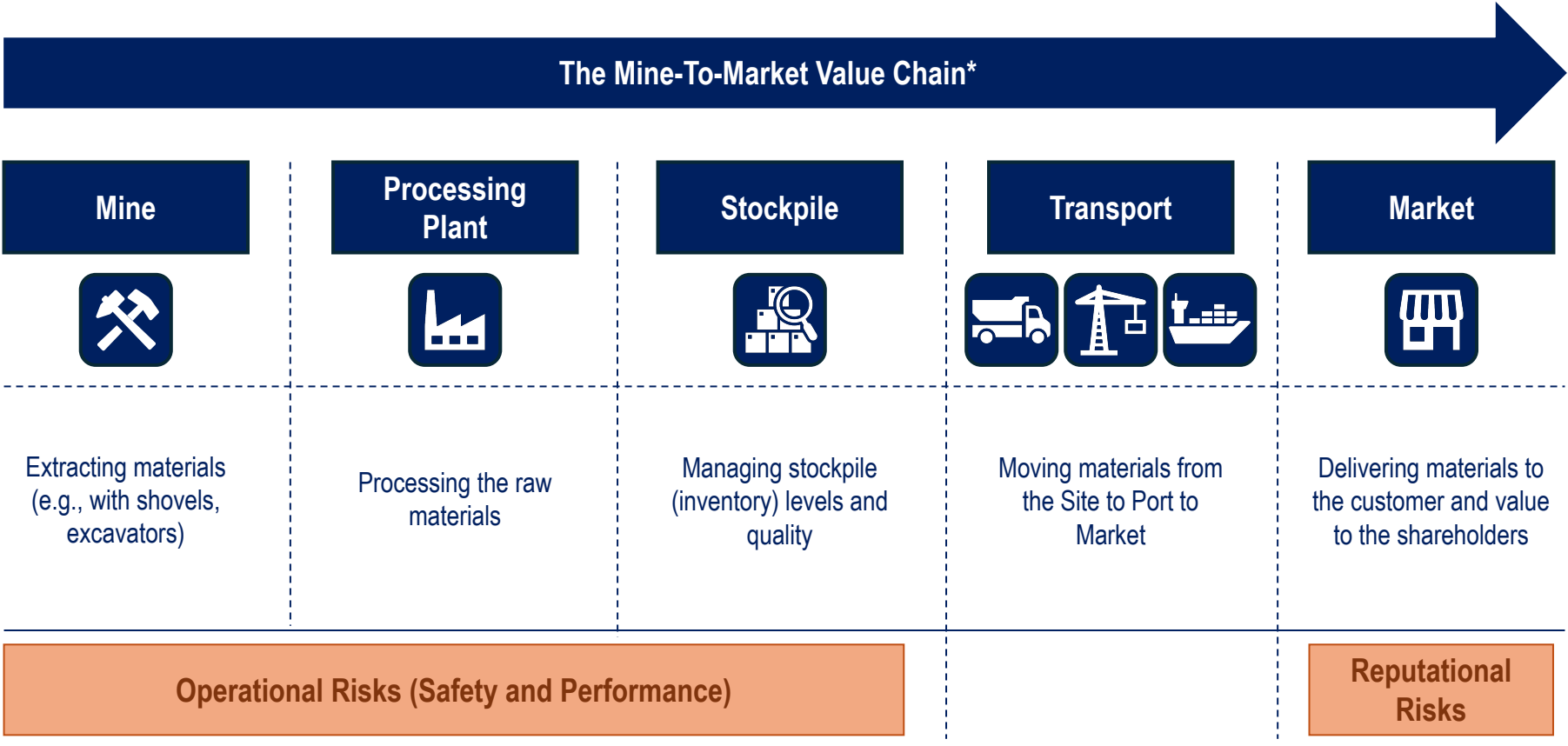
Most companies mention requirements to consult with potentially-affected water users in the process of developing their strategies, although evidence is largely limited to isolated examples and case studies.

Only a limited number of companies show evidence they track the implementation of these water stewardship strategies.”

When looking at the components of ESG (namely environmental, social and governance) it is clear that mining interacts with and impacts each component.

Water has a similar relationship with the components of ESG, playing a critical role in healthy environments and thriving communities and shaping governance at company, national and international levels to ensure water security for the future.

In addition to water's importance in ESG strategies and initiatives, the role of water in mining is equally important in terms of enabling safe, sustainable and profitable operations.



*Adapted from: McKinsey & Company, 2020. *The mine-to-market value chain: A hidden gem.* [Online].

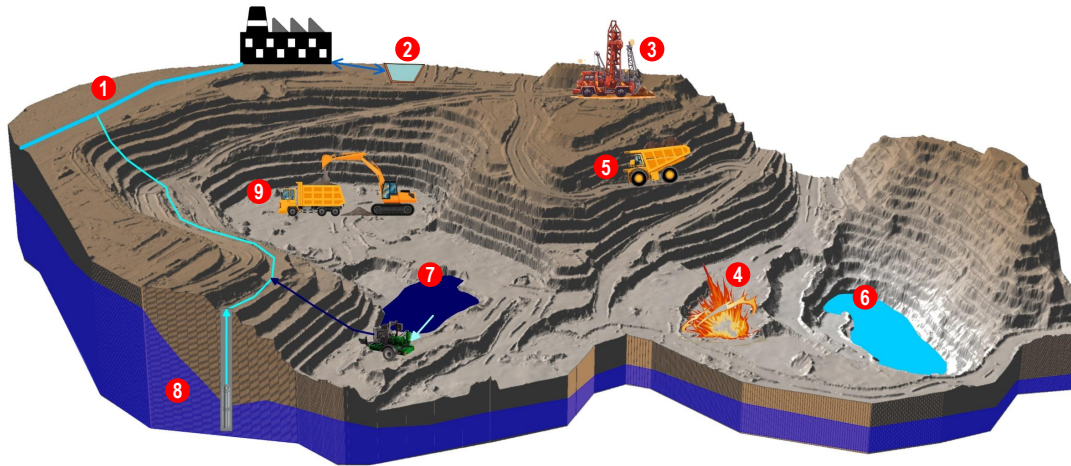


When looking at the components of ESG (namely environmental, social and governance) it is clear that mining interacts with and impacts each component.

Water has a similar relationship with the components of ESG, playing a critical role in healthy environments and thriving communities and shaping governance at company, national and international levels to ensure water security for the future.

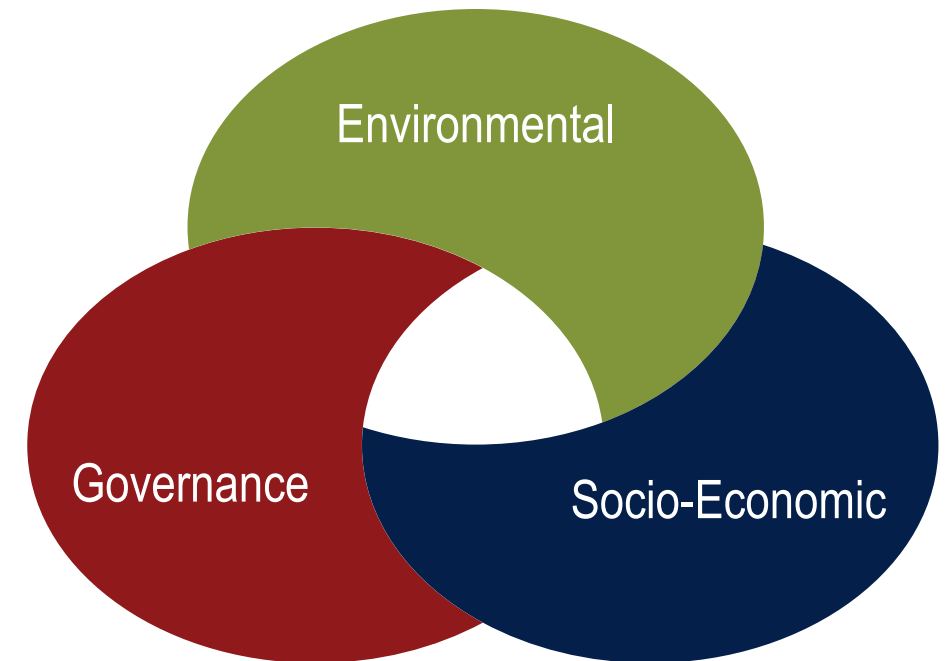
In addition to water's importance in ESG strategies and initiatives, the role of water in mining is equally important in terms of enabling safe, sustainable and profitable operations.

Operational Risks (Safety and Performance)



- | | | |
|--|---|---|
| 1 Water distribution for operational water supply and water security | 2 Affected/Contact water management and reuse/recycling | 3 Drilling activities for blasting operations |
| 4 Blasting activities | 5 Material haulage activities | 6 Inaccessible mining areas due to inundation |
| 7 Water accumulation due to rainwater runoff or groundwater ingress | 8 Active dewatering to reduce slope pore pressures and/or lower the groundwater table | 9 Loading Activities |

Reputational Risks



Water management is a complex task under any circumstance, with each system and element of the water cycle having their own internal intricacies and sensitivities, as well as ecological and societal dependencies on that water. In the mining environment this complexity is further compounded by the social and environmental impact that mine and processing activities have in terms of water availability and quality, as well as the operational risks posed to the mine by water (e.g., too much or too little water, etc.).

Effective management of water is a key factor in operating a safe, sustainable and profitable mine while maintaining compliance with legislative requirements and keeping the social license to operate with host communities, investors and market observers.

Treading this line between operational effectiveness and social acceptance is becoming more of a challenge with climate change impacts such as extreme weather conditions, population growth around mining operations and misaligned corporate and operational goals in terms of ESG.

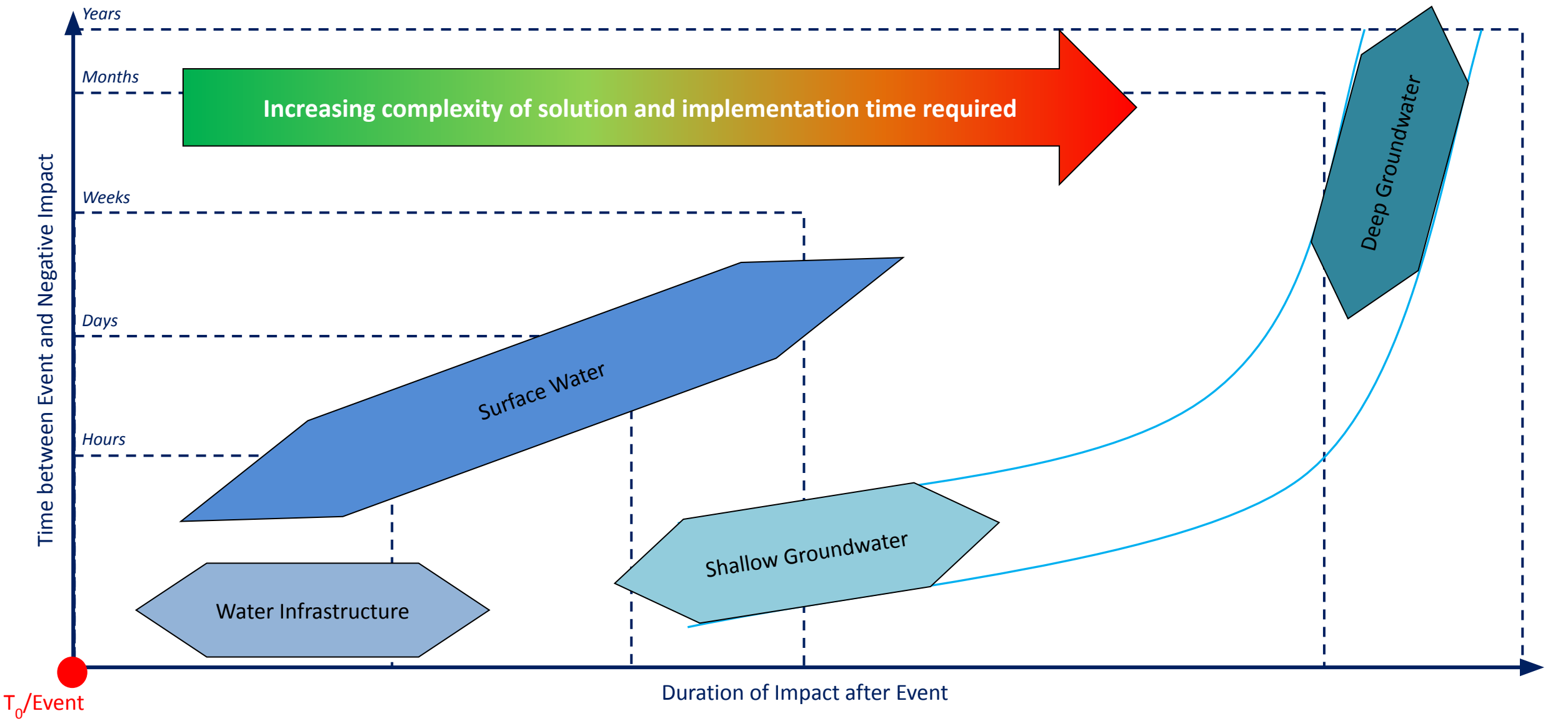
To contextualise the lattermost point, ESG goals and targets are typically set at the corporate level for mining houses, then rolled down to operations to implement and execute with limited engagement in terms of current operational challenges, concerns and constraints.

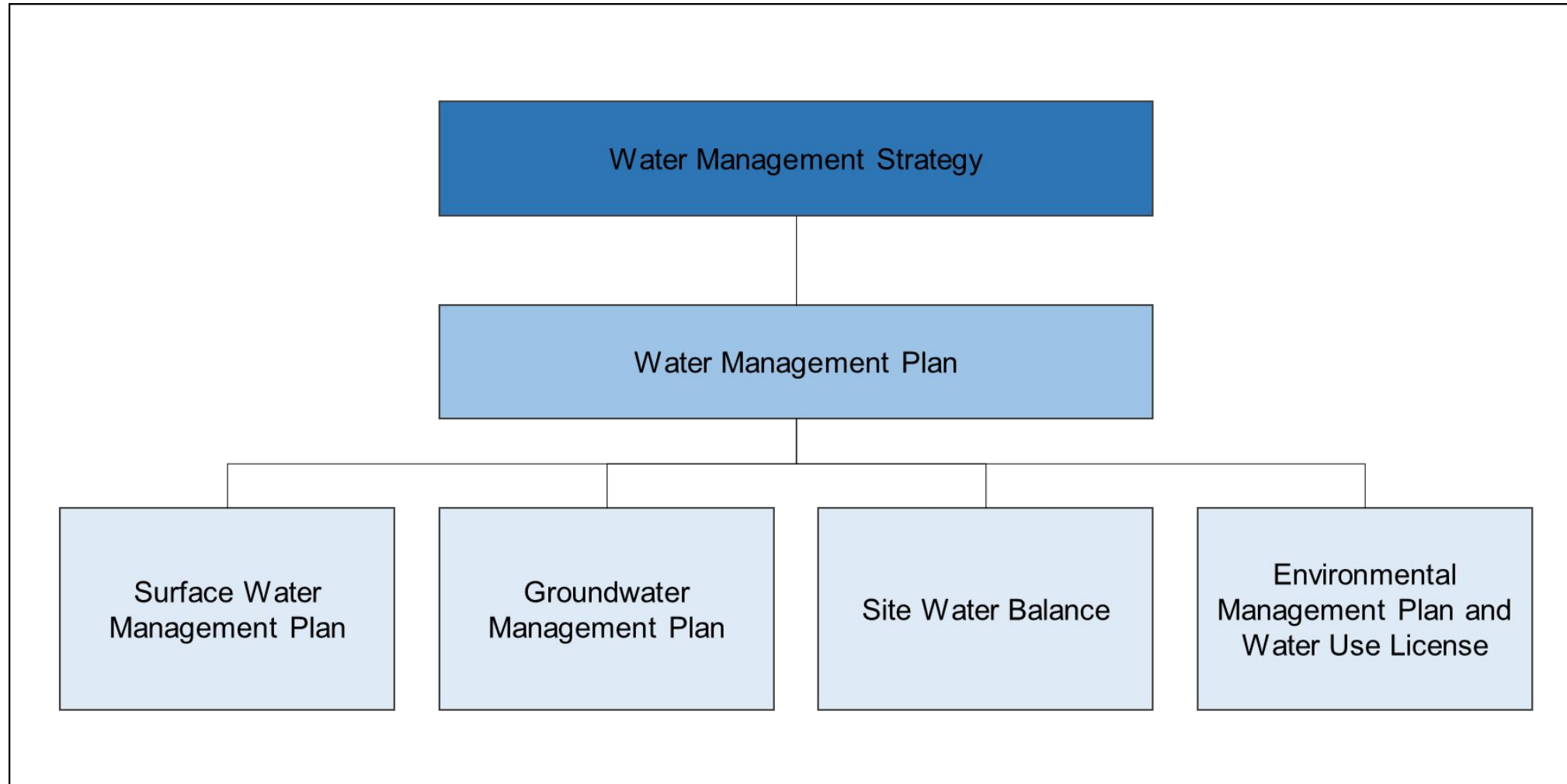


Grimwade (2022) listed the key objectives of operational risk management as:

1. Maximising returns, while staying within the current and future risk appetite;
2. Growing the business (or operation) both quickly and safely; and
3. Meeting the expectations of internal and external stakeholders.

Coupled with the complexity of water in the mining environment, effective water management relies on many interlinked components and systems that need to be managed across various timelines and consider both gradual and immediate changes in environmental conditions (e.g., climate change and extreme rainfall events, respectively).

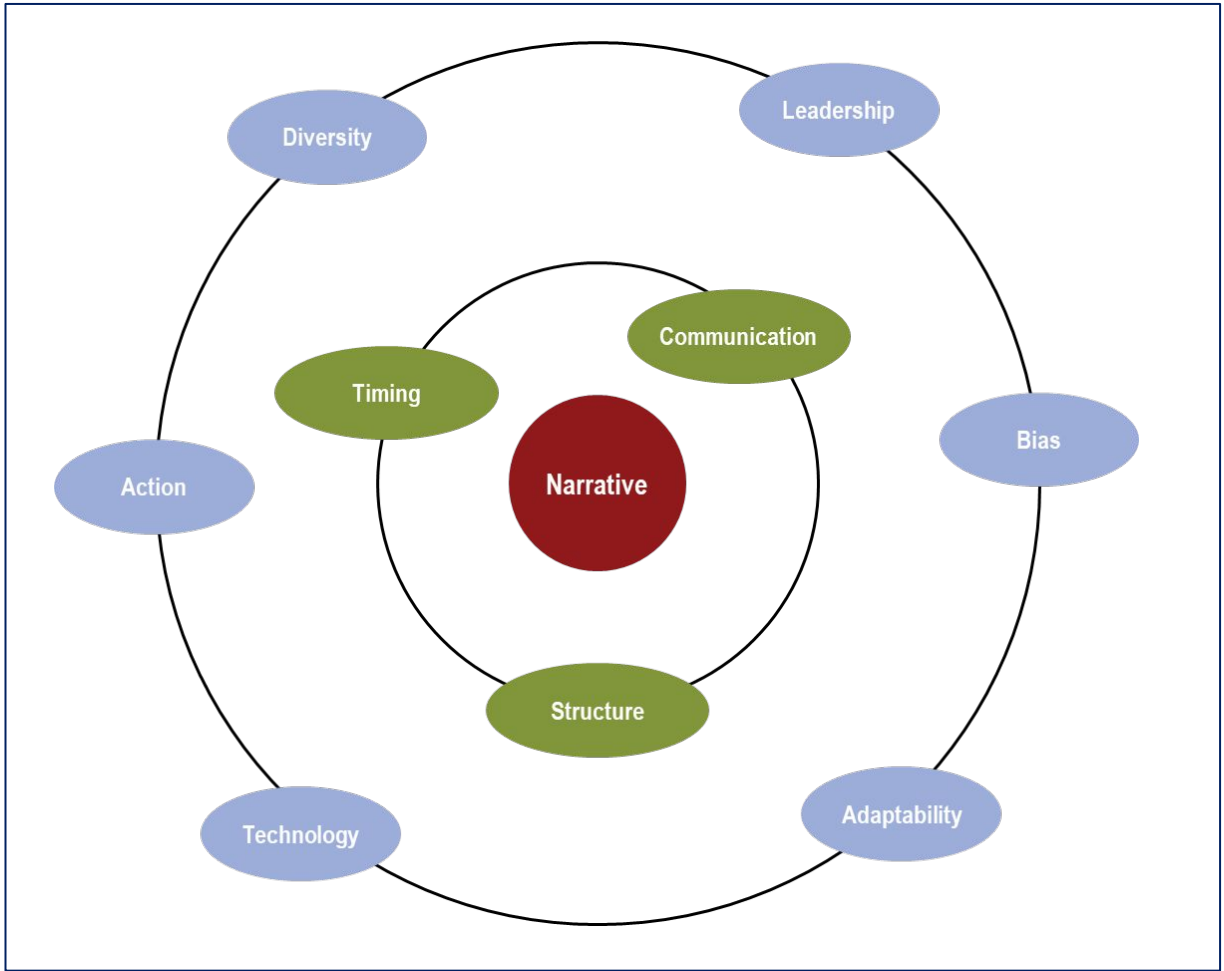




When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

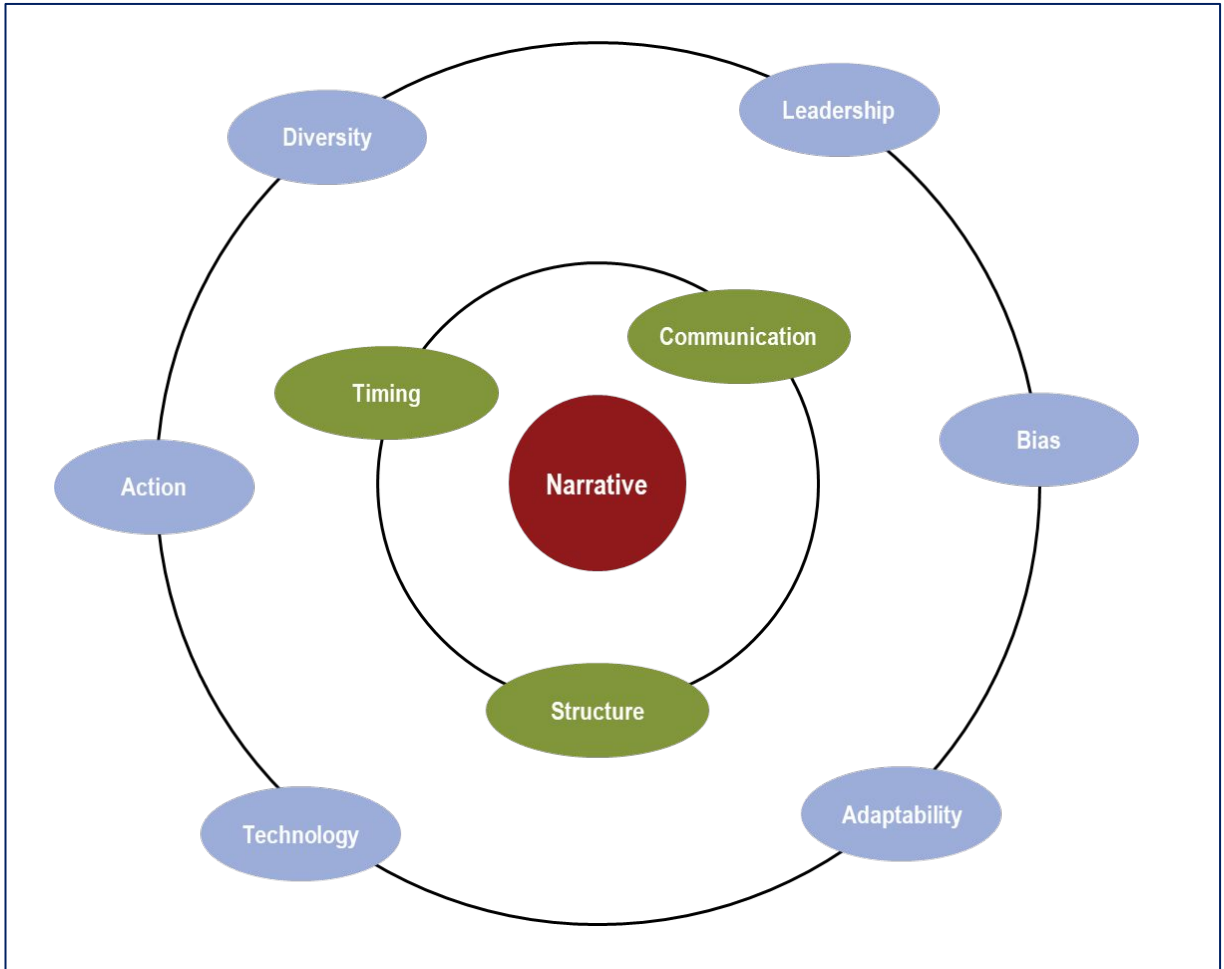
1. **Narrative:** *how an operation tells others about who they are, what they do and why they do it,*



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

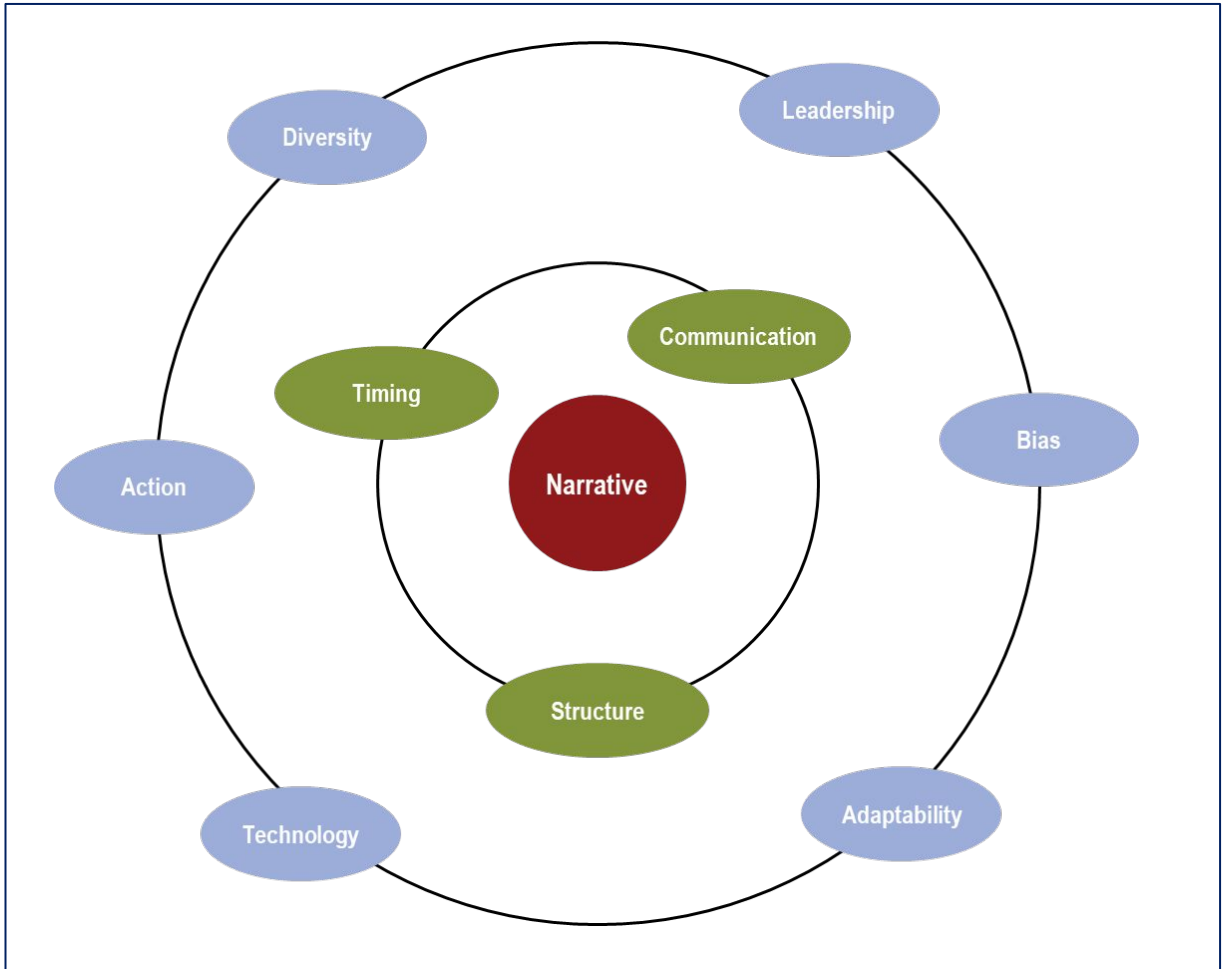
- 1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
- 2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

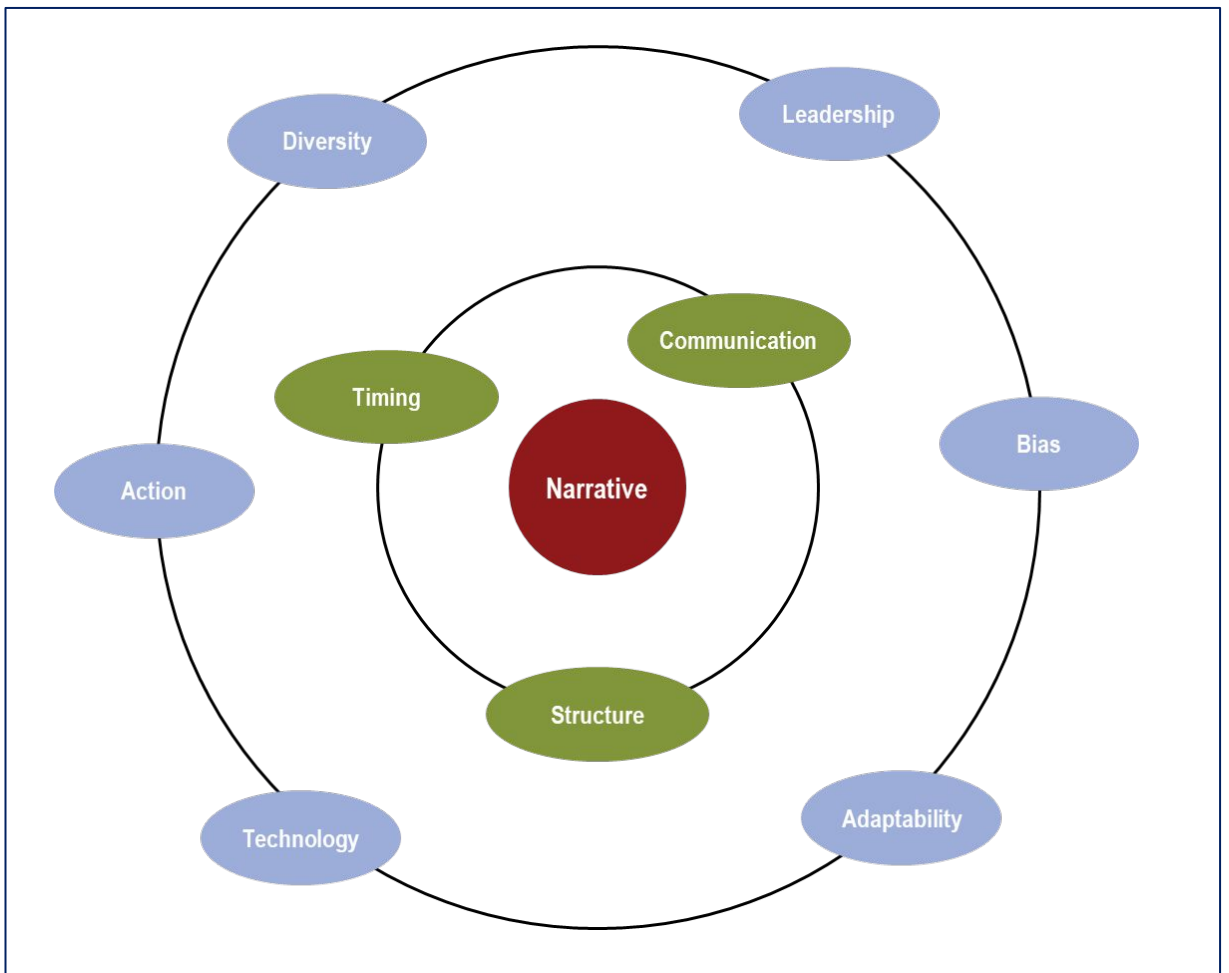
- 1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
- 2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
- 3. **Structure:** how an operation and its processes are designed,



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

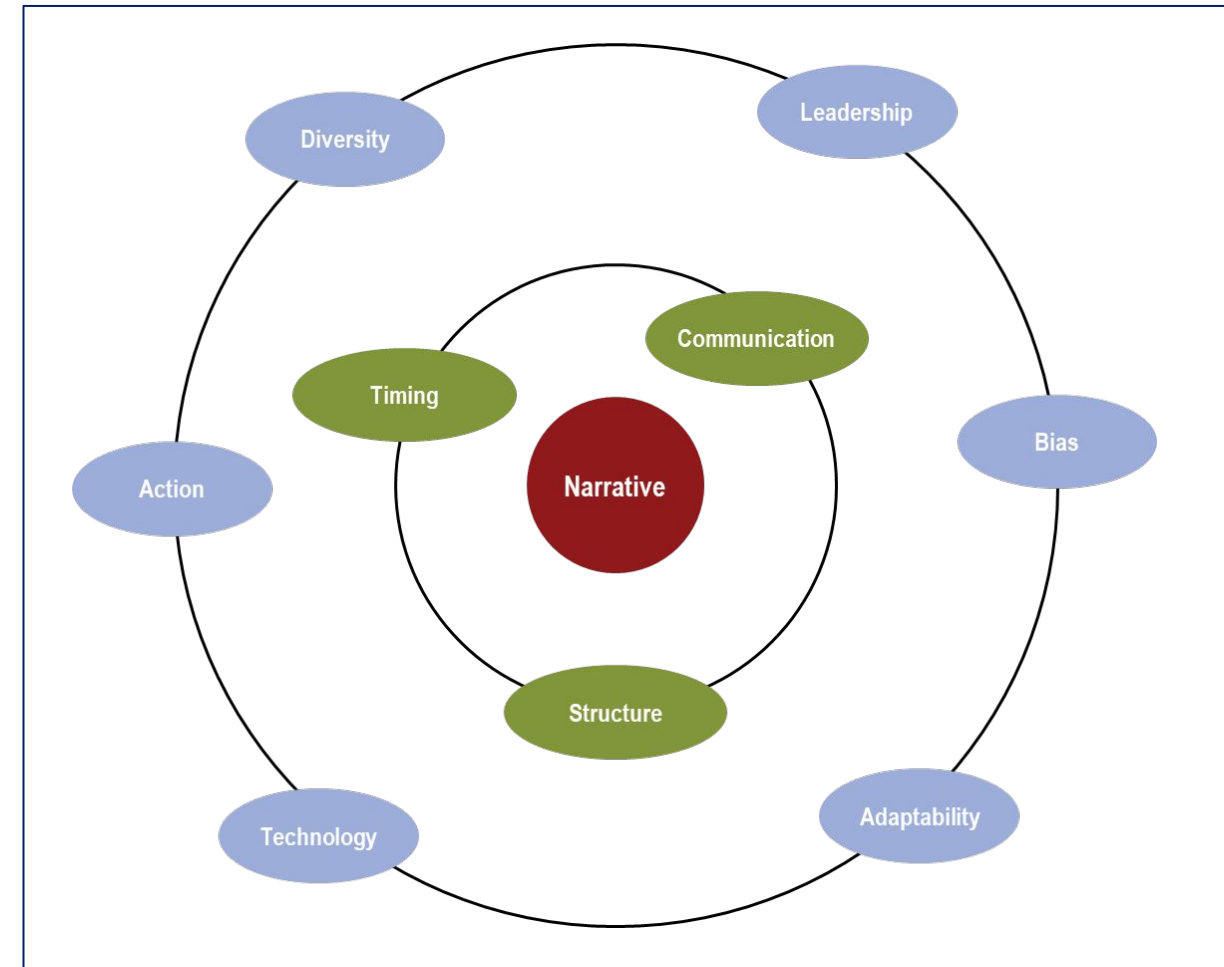
- 1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
- 2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
- 3. **Structure:** how an operation and its processes are designed,
- 4. **Technology:** how machinery, equipment, resources, and know-how are applied,



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

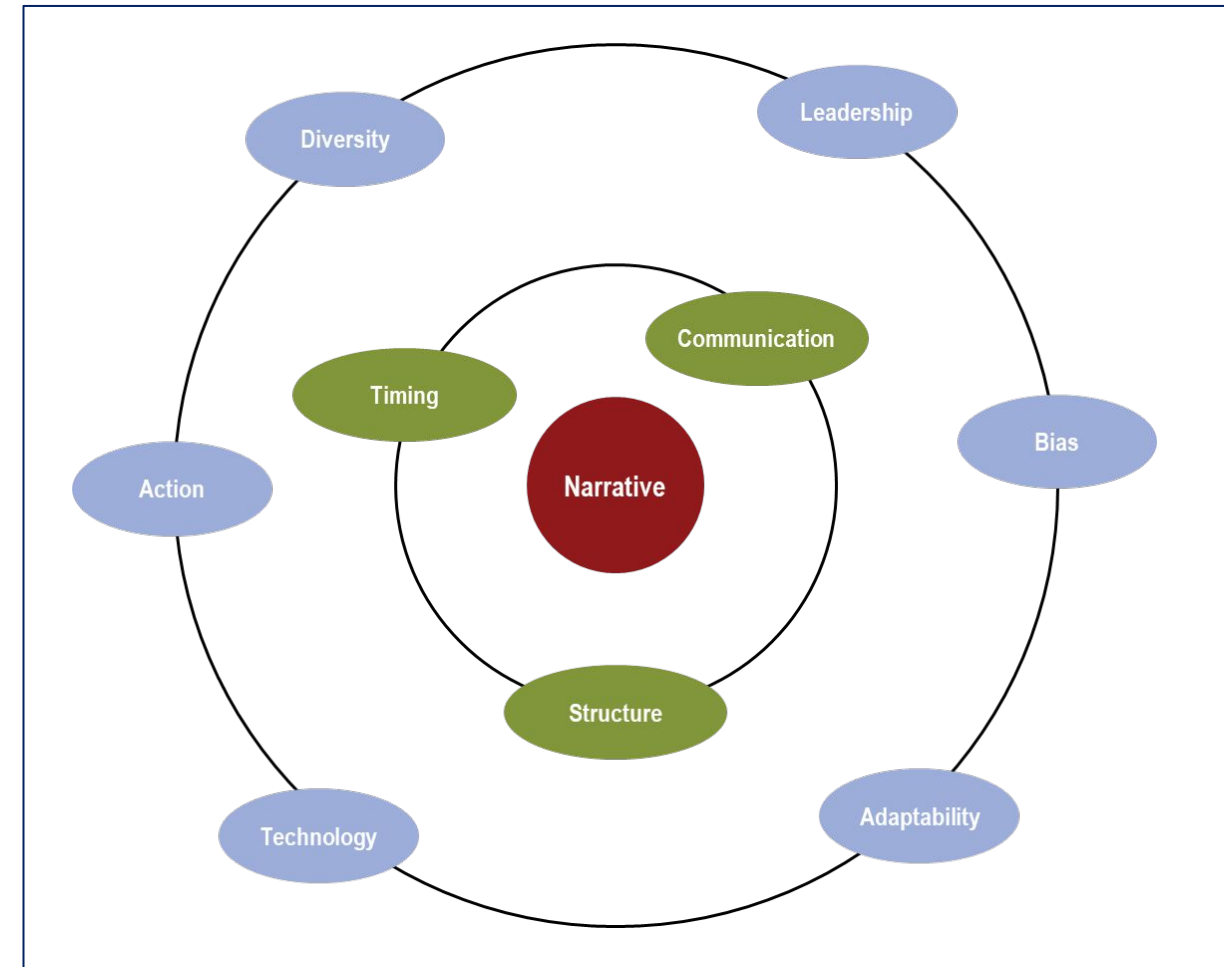
1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
3. **Structure:** how an operation and its processes are designed,
4. **Technology:** how machinery, equipment, resources, and know-how are applied,
5. **Diversity:** how a range of perspectives, abilities and objectives are leveraged in pursuit of a common goal



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

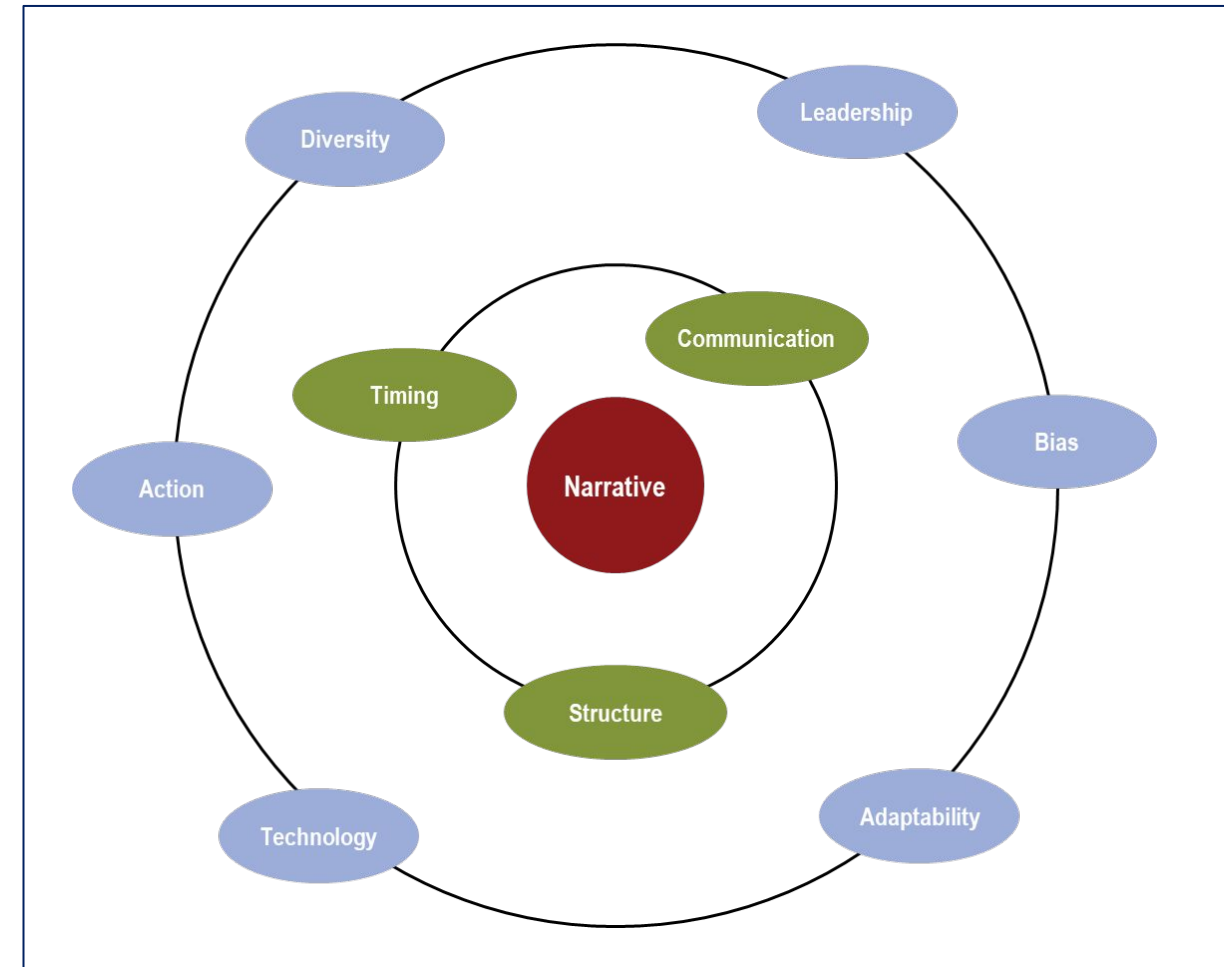
1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
3. **Structure:** how an operation and its processes are designed,
4. **Technology:** how machinery, equipment, resources, and know-how are applied,
5. **Diversity:** how a range of perspectives, abilities and objectives are leveraged in pursuit of a common goal
6. **Bias:** how the assumptions an operation and individuals have influence on decision-making,



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

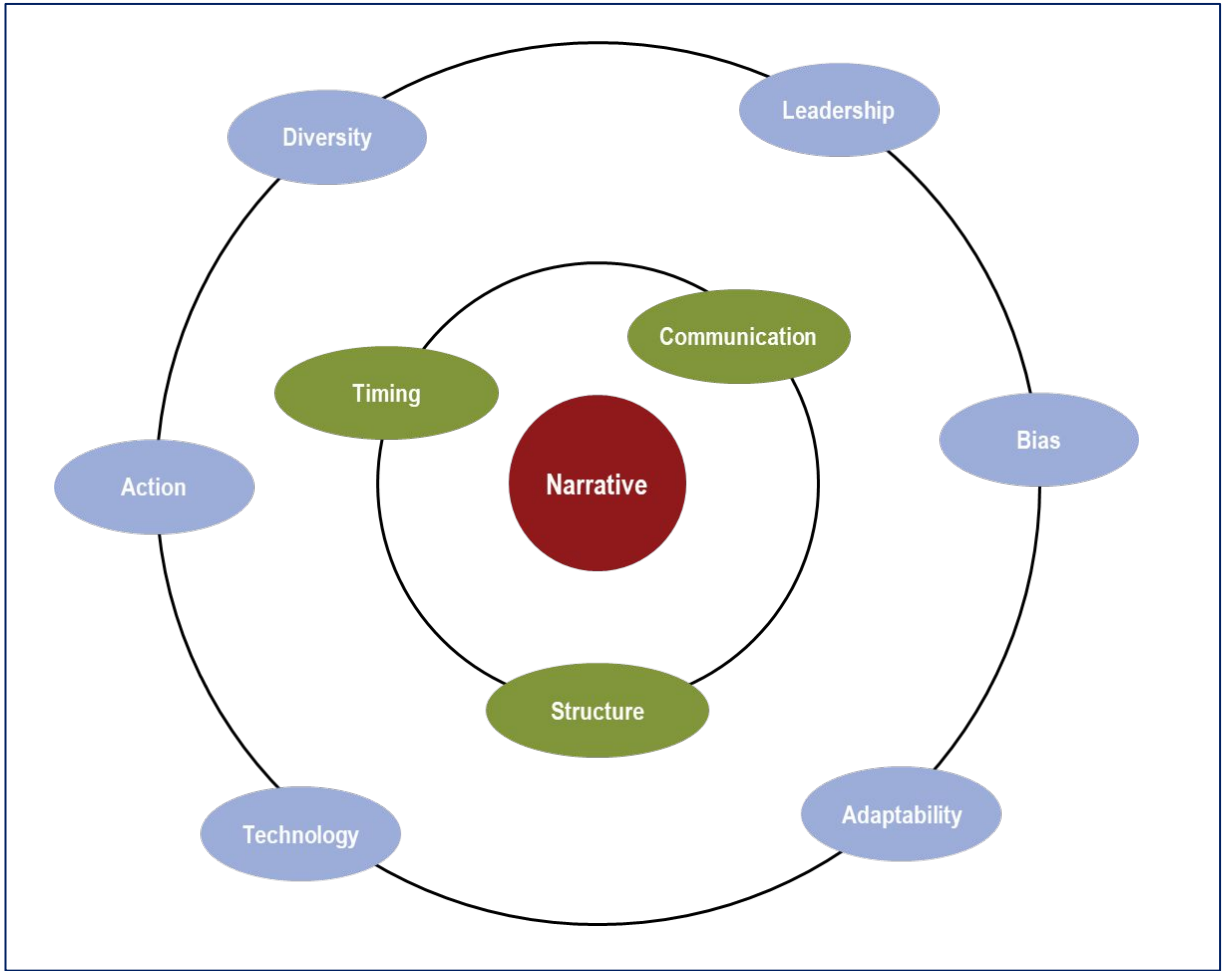
1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
3. **Structure:** how an operation and its processes are designed,
4. **Technology:** how machinery, equipment, resources, and know-how are applied,
5. **Diversity:** how a range of perspectives, abilities and objectives are leveraged in pursuit of a common goal
6. **Bias:** how the assumptions an operation and individuals have influence on decision-making,
7. **Action:** how inertia or resistance is overcome to drive a response,



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

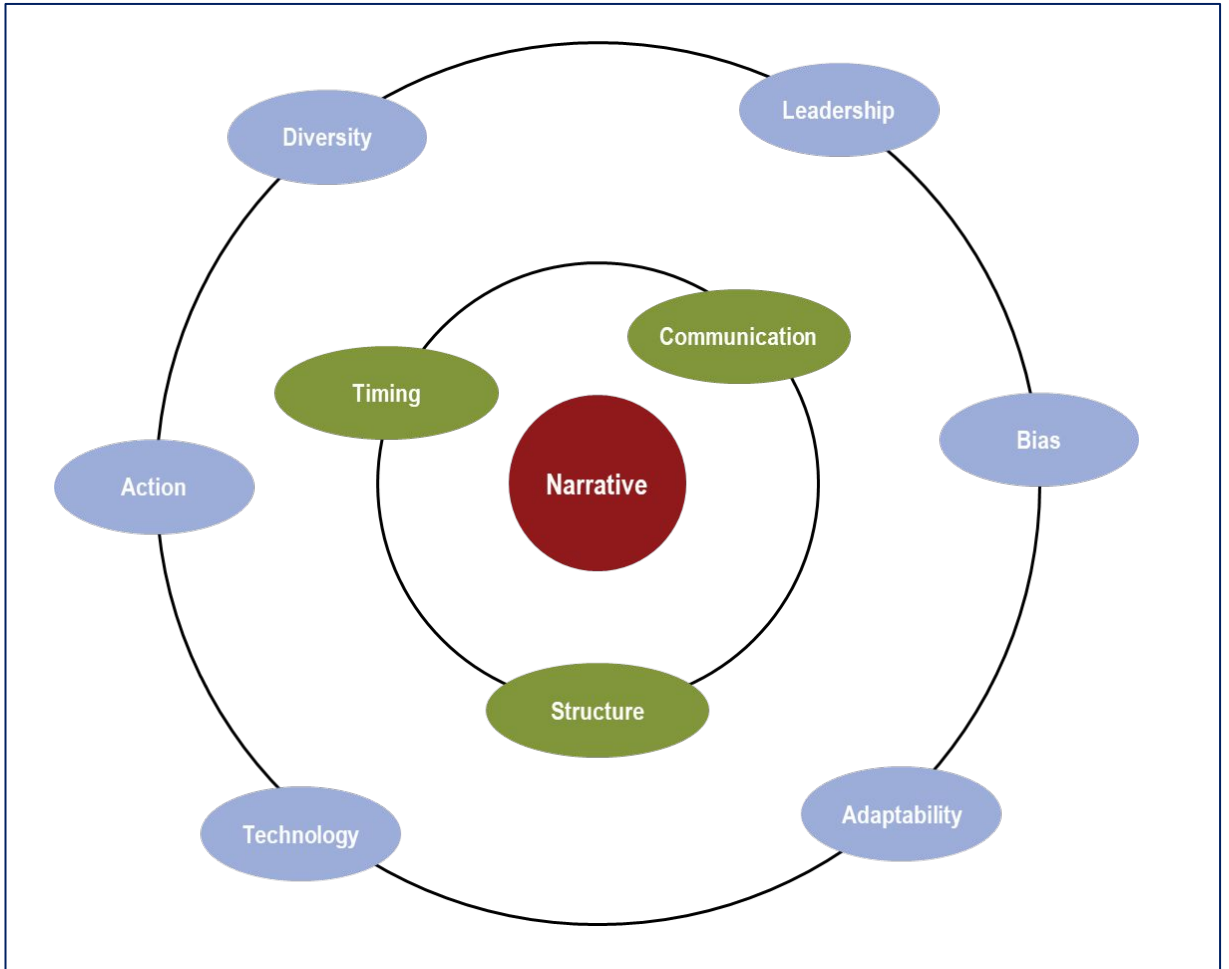
- 1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
- 2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
- 3. **Structure:** how an operation and its processes are designed,
- 4. **Technology:** how machinery, equipment, resources, and know-how are applied,
- 5. **Diversity:** how a range of perspectives, abilities and objectives are leveraged in pursuit of a common goal
- 6. **Bias:** how the assumptions an operation and individuals have influence on decision-making,
- 7. **Action:** how inertia or resistance is overcome to drive a response,
- 8. **Timing:** how the timing of action affects the effectiveness of an operation or individual's response,



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

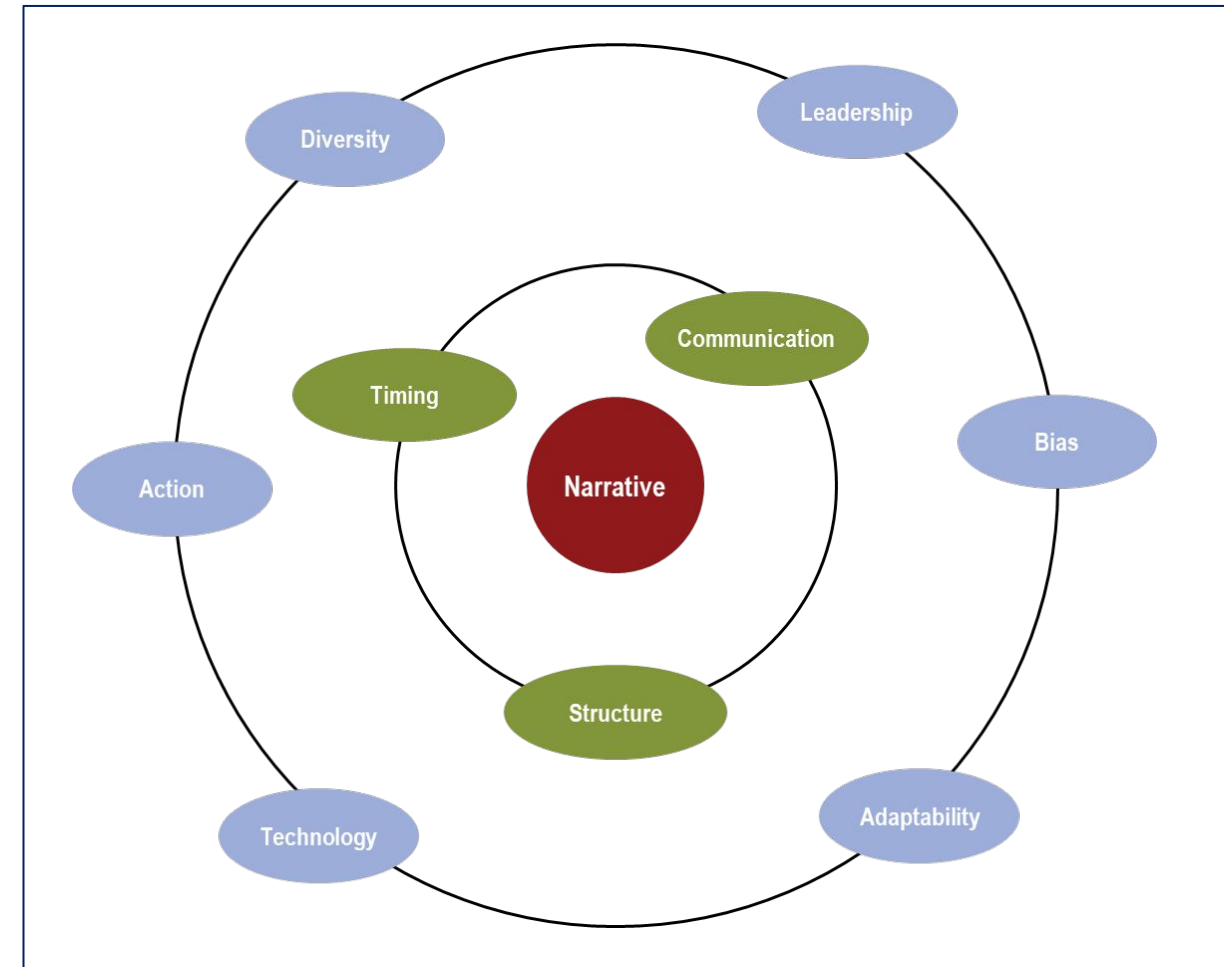
- 1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
- 2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
- 3. **Structure:** how an operation and its processes are designed,
- 4. **Technology:** how machinery, equipment, resources, and know-how are applied,
- 5. **Diversity:** how a range of perspectives, abilities and objectives are leveraged in pursuit of a common goal
- 6. **Bias:** how the assumptions an operation and individuals have influence on decision-making,
- 7. **Action:** how inertia or resistance is overcome to drive a response,
- 8. **Timing:** how the timing of action affects the effectiveness of an operation or individual's response,
- 9. **Adaptability:** how an operation responds to changes in risk profile and/or environmental conditions, and



When the layer of ESG strategies and targets are added to this hierarchy, the rhythms and routines of the operational water management teams are often disrupted which leads to conflict and eventual non-achievement of both operational and ESG goals.

To avoid these conflicts and disruptions, a narrative-driven leadership approach to water management can be combined with the 'Risk Immune System' concept developed by McChrystal (2021) to form a modified risk immune system approach that cements ESG goals and targets as the common narrative to water management activities across the water management hierarchy.

1. **Narrative:** how an operation tells others about who they are, what they do and why they do it,
2. **Communication:** how information is exchanged at the operation between internal stakeholders and with external stakeholders,
3. **Structure:** how an operation and its processes are designed,
4. **Technology:** how machinery, equipment, resources, and know-how are applied,
5. **Diversity:** how a range of perspectives, abilities and objectives are leveraged in pursuit of a common goal
6. **Bias:** how the assumptions an operation and individuals have influence on decision-making,
7. **Action:** how inertia or resistance is overcome to drive a response,
8. **Timing:** how the timing of action affects the effectiveness of an operation or individual's response,
9. **Adaptability:** how an operation responds to changes in risk profile and/or environmental conditions, and
10. **Leadership:** how an operation directs and inspires the overall risk immune system.



Narrative

Have ESG targets and objectives been defined for the operation?

Has the impact of these ESG targets on current, and future, water management requirements been considered and quantified?

Has the potential, or required, contribution of operational water management to achieving the ESG targets and objectives been mapped out over the life of operation and discussed with operational stakeholders (including host communities)?

Communication

Have regular engagement routines between stakeholders within and across the water management hierarchy been set?

Is the medium of communication for results and progress tracking suitable for all stakeholders (internal and external) for the operation?

Is the cadence of communication amongst stakeholders regular enough to enable effective decision-making under changing ESG conditions or observed deviations from targets and objectives?

Structure

- Has the ESG narrative been developed at a corporate level and cascaded downward through the water management hierarchy?
- Have the roles and responsibilities for water management been clearly defined and documented at all levels of the water management hierarchy?
- Does the structure include representation of stakeholders (internal and external) that represent both horizontal and vertical diversity?

Timing

- Are the timing requirements defined for the water system component? (i.e., when does action need to take place to be effective).
- Are adequate resources available to ensure action(s) can be taken within the required timeframe? Are backup solutions in place should timing of action fail?
- Where timing of action fails, has the impact of such failure been clearly defined and documented to be included in stakeholder engagement and decision-making processes?

Action

- Have appropriate trigger levels been defined and documented for the water system in terms of ESG-related changes (e.g., climate change, population growth, etc.)?
- Have adequate action plans been developed and resourced based on potential water-related risks to the operation and impacts on ESG target compliance?
- Are the appropriate predictive tools in place and documented for the planning of action(s) for the water system in terms of operational risk management and ESG target compliance?

Diversity

- Has the role of individual stakeholders been defined in terms of decision-making process(es)?
- Is there a communication plan to engage multiple levels of stakeholder in both vertical and horizontal direction? (i.e., both in levels of work and multi-disciplinary aspects)
- Are all stakeholders fluent in the subject matter being discussed? If not, has an educational or information sharing plan been developed to ensure all stakeholders are empowered to make informed contributions to decision-making?

Leadership

- Has a dedicated owner of water management been assigned at each layer of the water management hierarchy?
- Has an accountability framework, and mechanism for tracking accountability, been established and applied?
- Are the linkages between the layers of the water management hierarchy understood in terms of ESG target achievement (i.e., how the layers interact with one another)?

Bias

- Have organizational biases (if any) been identified and characterized?
- Have individual stakeholder biases (if any) been identified and characterized?
- Has an educational or information sharing plan been developed to ensure all stakeholders are empowered to make informed decisions regarding their biases and possibly change?

Adaptability

- Are all stakeholders fluent in the subject matter being discussed? If not, has an educational or information sharing plan been developed to ensure all stakeholders are empowered to make informed contributions to decision-making?
- Where change has been implemented, has the appropriate management of change process been followed and documented?
- Do the stakeholders involved in the change understand why the change was implemented and demonstrate this understanding?

Technology

- Are the technologies being implemented in the water management system technically suitable and reliable in terms of performance and contribution to ESG targets?
- Where alternative technologies are identified, have these been evaluated in terms of their application at the operation and their contribution to ESG targets?
- Are techniques used in the management of the water system sensitive to change? If yes, have appropriate mitigation measures been initiated or planned to reduce the sensitivity? (e.g., training of other team members in completing particular work).

Benefits

- ESG objectives and targets provide a common narrative for all layers of the water management hierarchy.
- By setting the operational narrative using ESG targets and objectives, operational buy-in can be obtained more easily and sustainably.

Opportunities

- ESG targets aligned with operational needs can provide funding access to initiatives.

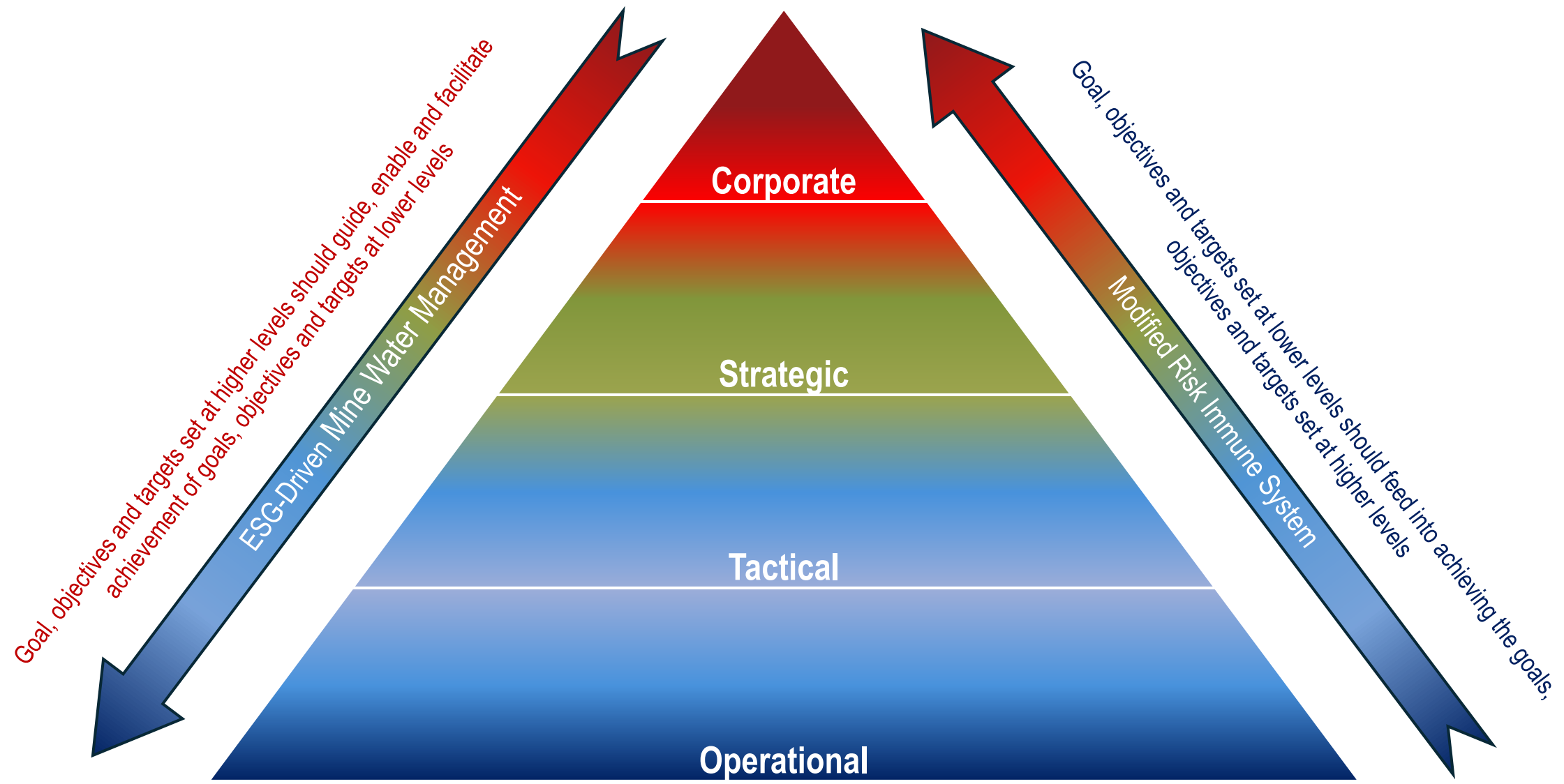


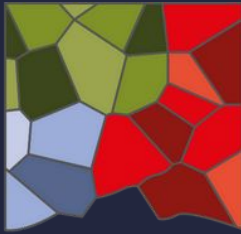
Benefits

- The modified risk immune system approach allows for all aspects of the operation's water system to be actively managed and controlled over multiple timeframes.
- The modified risk immune system approach enables and encourages adaptability at the operation, which may reduce operational and capital expenditure by empowering individuals to manage water proactively over multiple timeframes.

Opportunities

- Technology selection for water management can contribute to ESG goals and targets by reducing electricity consumption or greenhouse gas emissions by switching to renewable power sources.
- Effective communication, diversity and bias removal can improve relations with host communities at the operation, potentially reducing closure liabilities and social risk profiles.
- Improved adaptive capacity and timing of action can significantly reduce the water-related risk profile of the operation, potentially reducing both operating and capital expenditure for water management and/or standing time due to water-related issues.





DIGBY WELLS

ENVIRONMENTAL

Thank You

Matthew Damhuis
matthew.damhuis@digbywells.com

Making A Difference Locally with Global Impact

www.digbywells.com

info@digbywells.com

