

# Outline



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## Disclaimer



This is not a legal review of all pertinent legislation per country but is merely a summary of how environmental consultants have interpreted the legislation in the management of contaminated groundwater in their country/jurisdiction. All interpretations were made for information purposes only and does not constitute legal advice in any form.



## Thanks



RSK – Melanie Lyons (UK, Wales and Ireland)

RSK - Lucille Borè (France)

RSK – Gabor Peter (Hungary)

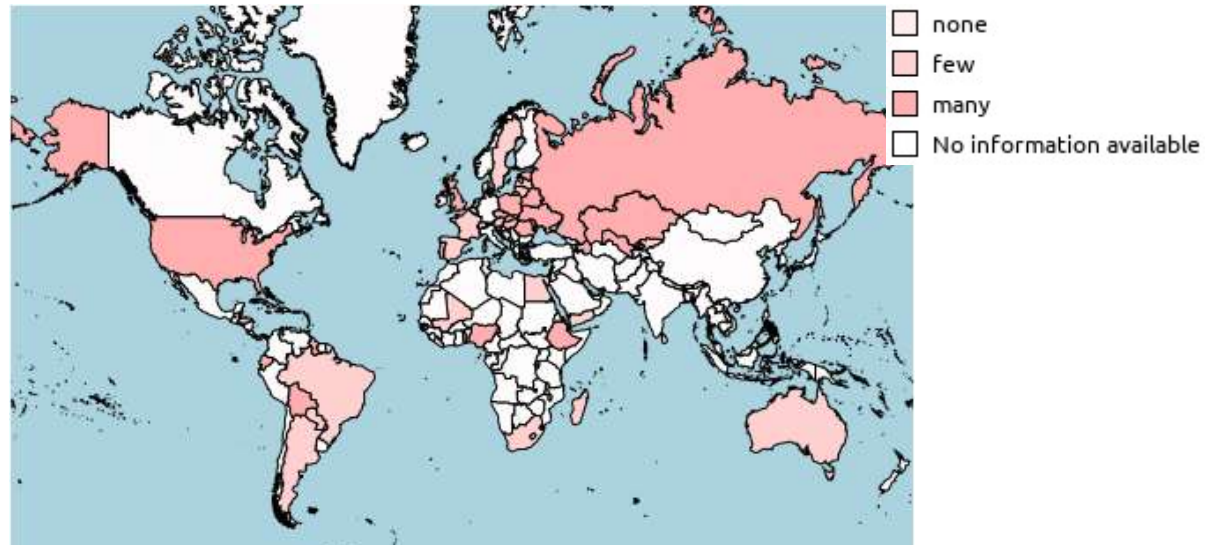
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RSK – Olivia Ashaba Ahebwa (Uganda)



# Groundwater Contamination



Title: Reported cases of pollution from industry  
License: Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) (CC BY-SA 4.0)  
Qualitative estimate of cases of groundwater pollution from industry (e.g. metals, DNAPLs).  
Publication Date Oct. 27, 2020



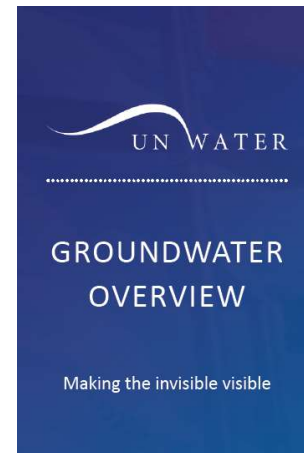
# Groundwater – Sustainable Development Goals



## GROUNDWATER IN THE SDGs

Groundwater is a key resource for achievement of the UN Sustainable Development Agenda for 2030 — but is still weakly conceptualised in the SDG (Sustainable Development Goal) 6 indicators or insufficiently known to provide a reliable indicator value. Professional assessment of groundwater status, trends and risks is required to interpret the state/condition of the groundwater resources, whose sustainability is essential for achievement of SDG-6 Targets.

Beside SDG-6, groundwater directly contributes to poverty eradication (Goal 1), food security (Goal 2), gender equality (Goal 5), sustainability of cities and human settlement (Goal 11), combating climate change (Goal 13) and protecting terrestrial ecosystems (Goal 15).



Produced by IGRAC (International Groundwater Resources Assessment Centre), 2018

In cooperation with UNESCO-IHP, IAH, IWMI and with contributions of many UN Water Members and Partners



## ‘The Opportunity Is Now’: Water Advocates View Upcoming UN Climate Conference as Moment of Relevance

*Water was overlooked in past global climate talks. Advocates are focusing on the Glasgow meeting to highlight water’s indispensable climate role.*



Demonstrators took to the streets at the 2009 global climate convention in Copenhagen. Photo © J. Carl Ganter/Circle of Blue

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# Country Summary





## Main Legislative Overview governing Contaminated Groundwater?

- National Environmental Management Act No. 107 of 1998 (NEMA).
- National Environmental Management: Waste Act No. 59 of 2008 (NEM:WA).
  - *Framework for the Management of Contaminated Land 2010 (FMCL)*
  - *The National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (Government Notice 331 of 2 May 2014)*
- National Water Act No. 36 of 1998 (NWA).
- South African Water Quality Guidelines (SAWQG)



## Principle underlying the legislation?

### Framework for the Management of Contaminated Land 2010 (FMCL)

The Framework for the Management of Contaminated Land was compiled in support of Part 8 of NEM:WA to provide 'norms and standards' for the identification and registration of contaminated sites, to provide a risk -based decision support protocol, and to offer a set of guidelines for site assessment reports. Prior to its existence there was no single consistent set of guidelines or legally applied regulations to assess the risk posed by contaminated land. The FMCL is based on a review of international practices around the world and includes a tiered system of Soil Screening Values (SSVs) for priority soil contaminants.



What site investigation and remedial measures are done as a result of the legislative environment?

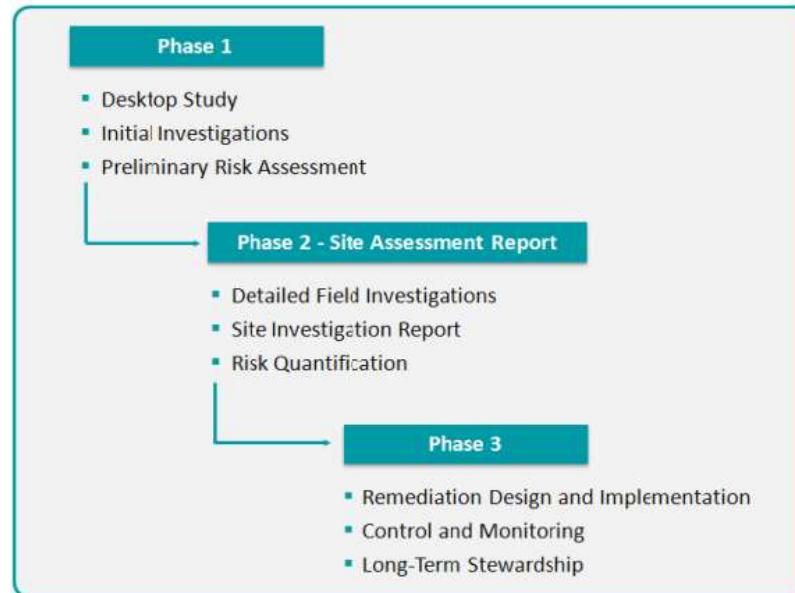


Figure 2: A phased approach for the assessment and remediation of contaminated land

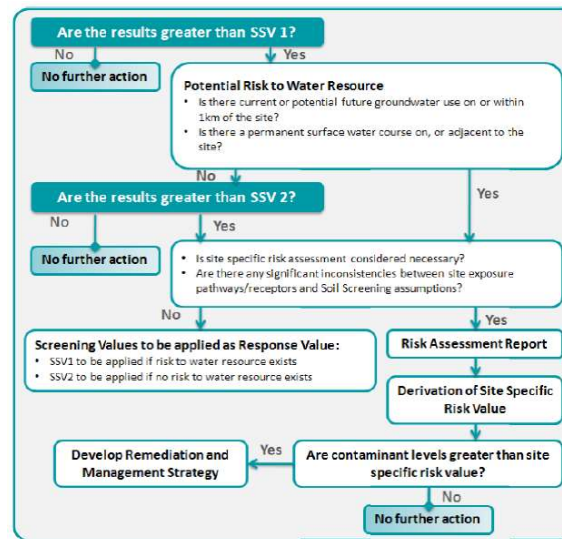


# South Africa



Soil Screening Value 1: soil quality values, expressed as mass of contaminant per mass of soil, that are protective of both human health and ecotoxicological risk for multi-exposure pathways, **inclusive of contaminant migration to the water resource**. Soil Screening Values 1 are applicable to all land-uses, and thus represent an ‘acceptable-risk’ situation, with no adverse effects on human health and the aquatic environment.

Soil Screening Value 2: soil quality values, expressed as mass of contaminant per mass of soil, that are protective of risk to human health in the absence of a water resource. Soil Screening Values 2 are land-use specific and have been calculated for three key land-uses namely, standard residential, informal residential settlements and commercial/industrial land-uses.



### Are there legislated risk based screening values for the protection of groundwater?

- No legislated risk based screening values specific for groundwater although reference to local and international water quality criteria are provided for priority contaminants listed in the FMCL and includes
  - Department of Water Affairs (DWA, 1996) – only for select contaminants and generally excludes organics
  - World Health Organisation Drinking Water (WHO, 2008)
  - Aquatic Water Quality (UK EQS Salmonid)
  - Aquatic Water Quality (BC Aquatics, 2006)
  - Aquatic Water Quality (NOAA, 2008)
- The FMCL considers an aquifer to be potentially unacceptably impacted if dissolved COPC concentrations in groundwater exceed the screening criteria used in the derivation of the SSVs, at a distance of 50 m (the compliance distance) from the source of the impact (in soil)).



### Who is liable for groundwater contamination?

- Polluter pays principle – land owner or operator

### Is groundwater considered a receptor or pathway to contamination?

- Both - current and potential future resource value of groundwater is considered in the context of groundwater being a receptor IF groundwater use identified within 1 km of the site or presence of surface water on or adjacent to the site boundary. But groundwater is also considered as a potential migration pathway for potential risks to human health and also risks to surface water bodies via migration of dissolved phase pollutants.

### Are there legislated timeframes for the assessment and remediation of contaminated land/groundwater and regulatory interaction?

- No





## Main Legislative Overview governing Contaminated Groundwater?

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Groundwater (Amendment) Regulations (Northern Ireland) 2014
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.
- The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015
- The Water Supply (Water Quality) (Amendment) Regulations (England and Wales) 2018
- The Water Supply (Water Quality) Regulations (Northern Ireland) 2017
- The Private Water Supplies (England) Regulations 2016. SI 2016 / 618
- The Private Water Supplies (Wales) Regulations 2017
- The Private Water Supplies Regulations (Northern Ireland) 2017 SR 211
- The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (as amended). SI 1996 / 3001
- The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009
- The Environmental Permitting (England and Wales) Regulations 2016





## Principle Underlying the Legislation?

**Risk based** - The main objectives of the assessment, protection and remediation of groundwater under threat from land contamination are set out within the Environment Agency's "Groundwater protection guides covering: requirements, permissions, risk assessments and controls (previously covered in GP3)", March 2017 and the associated guidance "Land contamination groundwater compliance points: quantitative risk assessments (March 2017)". Both documents are guidance, but they are enforced by the regulatory authority for groundwater protection (Environment Agency) and supported by various elements of legislation listed under 5.

Where pollutants have not yet entered groundwater, all necessary and reasonable measures must be taken to:

- prevent the input of hazardous substances into groundwater
- limit the entry of other (non-hazardous) pollutants into groundwater to avoid pollution, deterioration in the status of groundwater bodies and to prevent sustained, upward trends in pollutant concentrations in groundwater.

Where pollutants have already entered groundwater, the priority is to take all necessary and reasonable measures to:

- minimise further entry of "contaminants" where there is a defined source
- limit the pollution of groundwater or any effect on the status of the groundwater body from the future expansion of the 'plume', if necessary, by actively reducing its extent.







## Principle Underlying the Legislation (continued)

The principles of minimising / limiting extent of pollution follow a risk based approach. Whilst there are not specific regulatory assessment criteria applicable to groundwater contamination, we use assessment criteria dependant on the end receptor, i.e.. potable water supply (Drinking water standards) or surface water quality (Environmental Quality Standards). Where pollutants are already present in groundwater, we initially undertake a **generic quantitative risk assessment** (GQRA) by comparing measured concentrations of pollutants in groundwater against the relevant assessment criteria. If concentrations in groundwater are found to exceed the assessment criteria at GQRA, then we progress on to a **detailed quantitative risk assessment** (DQRA) where we use numerical models to simulate the processes of dilution, attenuation and degradation of pollutants in groundwater along a migration pathway to a defined compliance point. The same assessment criteria as the GQRA are then used to assess the magnitude of the predicted breakthrough concentrations at the defined compliance point. The EA guidance defines a default initial **compliance point for hazardous substances of 50m from the edge of the groundwater plume** (250m for non-hazardous substances). However, there is the opportunity to consider extended compliance points depending on the site setting and with consideration of sustainability factors.





## What site investigation and remedial measures are done as a result of the legislative environment?

The Environment Agency have published the overarching guidance "Land Contamination Risk Management", October 2020 which defines the overall approach expected by the regulator when managing the risks from land contamination. The LCRM guidance defines a tiered, risk based approach to assessment and management of land contamination, progressing from Stage 1 - Risk assessment, through to Stage 2 - Options appraisal and culminating (if required) at Stage 3 - Remediation and verification.

At each stage of assessment the LCRM guidance defines expected assessment and reporting approaches, with a strong emphasis on the competency of the practitioners involved.

## Are there legislated risk based screening values for the protection of groundwater?

- No - there are no risk based screening values specifically applicable to groundwater in the UK. In the absence of groundwater specific values, we commonly apply risk based assessment criteria which are intended to be applied to the receptor, namely potable water supply users (Drinking water standards) which are intended to be applied to water quality in consumers taps, or surface water quality criteria (Environmental Quality standards) which are intended to be applied to surface water quality.





### Who is liable for groundwater contamination?

- The polluter pays principle is applied in the UK, and is implemented via The Environmental Damage (Prevention and Remediation) (England) Regulations 2015, The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009 and The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009

### Is groundwater considered a receptor or pathway to contamination?

- Both - current and potential future resource value of groundwater is considered in the context of groundwater being a receptor IF groundwater use identified within 1 km of the site or presence of surface water within 1 km from site boundary. But groundwater is also considered as a potential migration pathway for potential risks to human health (i.e.. vapour exposure) and also risks to surface water bodies via migration of dissolved phase pollutants.

### Are there legislated timeframes for the assessment and remediation of contaminated land/groundwater and regulatory interaction?

- No





### Main Legislative Overview governing Contaminated Groundwater?

- “Bodemdecreet Decreet van 27 Oktober 2006 betreffende de bodemsanering en de bodembescherming”
- “VLAREBO 2008 14 December 2007 Besluit van de Vlaamse Regering houdende vaststelling van het Vlaams reglement betreffende de bodemsanering en de bodembescherming”



### Principle Underlying the Legislation?

Follows a tiered risk based approach to the investigation and remediation of contaminated land to assess risk to human health and ecological impact. Threshold values are provided as a Tier I screening of results. Although risk based also makes provision for absolute maximum values allowable OR **threshold values** that should not be exceeded even if no risk is present. For example > TPH of 20,000 mg/kg in soil triggers remediation irrespective of presence of risk as well as the presence of LNAPL. For groundwater threshold value only applicable for chlorinated solvents (1, 5 or 10% of solubility for specific chlorinated compounds).

The concept of historical versus new contamination plays important role – From the day that the legislation was enacted (1995) any incident after that date is considered new. Any incident prior to that date is considered historical. Authorities consider that since all new operations conducted since the enactment of the legislation had to abide by environmental legislation, permits etc. any new incident warrants remediation to **natural state** and irrespective of risk. For all historical contamination remediation is risk based.



### What site investigation and remedial measures are done as a result of the legislative environment?

Allows for a phased approach to the investigation of groundwater (Phase I, Phase II etc.). It is a legal requirement to undertake an intrusive assessment (both soil and groundwater assessment) with any **property transfer** referred to as Oriënterend bodemonderzoek (*Initial Site Assessment*). If during the Initial Site Assessment the values do not exceed the threshold values no reason to proceed with additional investigation.

Should values > threshold values then follow up investigation and Quantified Risk Assessment (QRA) is a legal requirement.

If an initial site assessment was not undertaken as part of the property transfer the transaction can be nullified in court. Authorities have a maximum of 60 days to respond to Initial Site Assessment and if not it is automatically deemed granted.

If ISA indicates that remediation is required the property transfer can go ahead on the conditions that (1) Seller has to sign a binding letter to the authorities pledging to undertake the remediation and agreeing that should he/she fail to implement remediation the regulators can do so on his behalf and forward the costs to do so to him/herself and (2) Provide a financial provision in the form of a bank guarantee for the full costs of remediation. The financial provision is prepared by an environmental consultant and has to be approved by another third party environmental consultant.



## Belgium – Flanders Region



Are there legislated risk based screening values for the protection of groundwater?

- Yes – “Bodemsaneringsnormen” provides a Tier I value for priority contaminants for all land uses combined



### Who is liable for groundwater contamination?

- The operator of the land is legally obliged to pay for the initial site assessment as part of the property transaction. If he/she can prove that contamination is not as a result of his/her actions they can be exempted. Should operator not be relevant then land owner is liable and if neither operator or land owner is present then the authorities accept responsibility for the assessment and remediation of the land.
- If the operator refuses to do the assessment work the regulator can take the case to court and thereafter investigate and remediate the site and pass on the costs to the operator.

### Is groundwater considered a receptor or pathway to contamination?

- Considered as a receptor first and if impacted then considered as a pathway that could impact other receptors (surface water, etc.)

### Are there legislated timeframes for the assessment and remediation of contaminated land/groundwater and regulatory interaction?

- Yes, Authorities have a maximum of 60 days to respond to Initial Site Assessment and if not it is automatically deemed granted. Also for Remediation Plans they have 90 calendar days to respond and if not its considered automatically approved.







## Main Legislative Overview governing Contaminated Groundwater?

- Environmental Protection Act (Act Number 53 of 1995) covers all environmental matters and enhances right to healthy environment. It provides authorisation to parliament to issue specific decrees for each environmental aspect;
  - Soil and Groundwater decree 219/2004
  - Hungarian list (similar to Dutch List that was used prior to legislation) provides trigger values and action levels for specific compounds. These were accepted in joint Environmental decree 6/2009 made by Ministries of Environment, Health and Agriculture.





## Principle Underlying the Legislation?

The Hungarian list makes provision for two categories namely a) natural values and b) Target values. Should initial assessment indicate that b values are exceeded indicative that further action should be taken which includes;

- Vertical and horizontal delineation of impact
- Preparation of Conceptual Site Model
- Quantified Risk Assessment that will provide site specific remediation target
- Prognosis of impact in 5 to 10 years which has been interpreted as modelling (basic analytical to detailed numerical modelling)
- Report detailing the above is submitted to the authorities





## What site investigation and remedial measures are done as a result of the legislative environment?

Follows typical Phase I and Phase II process. Major difference is the consideration that unimpacted groundwater and soil should be seen as a receptor. Therefore, emphasis is made on the delineation of a contamination plume and assessing plume stability. **Risk based approach only valid for stable or shrinking plumes.** Increasing plume dynamics imply that remediation is required. Remediation could be in the form of localized interventions to limit the spread of the plume (i.e. hydraulic barriers, negative pressures etc..)



# Hungary



Are there legislated risk based screening values for the protection of groundwater?

- Yes – Hungarian List





## Who is liable for groundwater contamination?

- Polluter pays principle. Very few sites have been taken over by the authorities

## Is groundwater considered a receptor or pathway to contamination?

- Considered both a receptor and pathway. For example once a contaminant plume has formed unimpacted groundwater surrounding the plume is considered a receptor.

## Are there legislated timeframes for the assessment and remediation of contaminated land/groundwater and regulatory interaction?

- No. During the initial site assessment consultant has to provide timescale which cannot be deviated from once approved





## Main Legislative Overview governing Contaminated Groundwater?

There is no specific legislation governing contaminated groundwater however, these are regulations relevant to mitigation of contamination of groundwater;

- National Environment (Waste Management) Regulations S.I. 49 of 2020
- National Environment (Standards for Discharge of Effluent into Water or Land) Regulations, 2020
- The Water Act, Cap. 152
- Petroleum (Waste Management) Regulations, S.I. 3 of 2019
- National Environment Act, No. 5 of 2019
- Guidelines for the Management of Landfills in Uganda December 2020



# Uganda



## Principle Underlying the Legislation?

Environment Act states that once pollution has occurred that “*polluter should take steps to clean up and restore the environment as near as possible to its original state*” and is therefore not risk based.

Whilst there are not specific regulatory assessment criteria applicable to groundwater contamination, detection limits of groundwater monitoring indicators (Guidelines for the Management of Landfills in Uganda December 2020) have been applied.





## What site investigation and remedial measures are done as a result of the legislative environment?

Available legislation more slanted toward EIA regulations (ESIA) and therefore does not govern soil and groundwater investigations. Site investigations mostly driven by corporate governance of large multinationals operating in country and/or investigative methodologies developed by environmental practitioners embarking on projects.

## Are there legislated risk based screening values for the protection of groundwater?

- No, there are no risk based screening values specifically applicable to groundwater. However, there are detection limits of groundwater monitoring indicators that are provided (Guidelines for the Management of Landfills in Uganda December 2020).
- During project development of waste management facility e.g., landfill, the developer is supposed to conduct an Environmental Social Impact Assessment (ESIA) to acquire the waste management license issued by National Environment Management Authority (NEMA) after complying with the environmental safeguards and protection requirements specified.





# Uganda



## Who is liable for groundwater contamination?

- The polluter pays principle is applied in Uganda, which requires the polluter to bear the costs of pollution prevention and control measures. The polluter pays principle is implemented through the National Environment Act, No. 5 of 2019 and Guidelines for the Management of Landfills in Uganda December 2020.

## Is groundwater considered a receptor or pathway to contamination?

- Not well defined in legislation but practically considered both a receptor and pathway by environmental practitioners.

## Are there legislated timeframes for the assessment and remediation of contaminated land/groundwater and regulatory interaction?

- No





## Main Legislative Overview governing Contaminated Groundwater?

There are **no specific regulations** directly related to contaminated soil and groundwater. The regulations in the existing laws (including Law 48 of 1982) are related to discharge of effluent and liquid waste to water bodies. There are also EIA regulations that control discharges to water resources.

The implementation of environmental laws and policies in Egypt is carried out by the Egyptian Environmental Affairs Agency (EEAA) which is the executive arm of the Ministry of Environment.

Numerous governmental institutions have traditionally held jurisdiction over various aspects of environmental policy and management. These include ministries of petroleum, water resources, industry, housing, health, agriculture and defense, among others.

Law 4 of 1994 and its executive regulations (1995) (amended by Law 9 in 2009; Ministerial Decision 1095 of 2011 and Law 105 in 2015) define the roles and responsibilities of EEAA to avoid conflicts with existing laws, which include regulation of air pollution, control of hazardous substances, management of hazardous waste and control of discharges to marine waters. Nonetheless, responsibility of existing laws and regulations remain in the traditional ministries.





## Principle Underlying the Legislation?

The Egyptian Civil code places responsibility for environmental and/or health damages on the owner/operator of the site, unless proven otherwise. However, these regulations do not address the specific requirements (e.g., cleanup levels) and procedures in the case where pollution has already occurred.

From US AID The Future of Remediation in Egypt Document, 2008

*“The need for a regulatory framework addressing the remediation of contaminated industrial sites in Egypt is of primary importance. Without such a framework, development and operationalization of all other requirements (i.e., institutional, technical, financial, and community awareness) would be futile and unsustainable. Accordingly, the regulatory, institutional, technical, and financial requirements for site remediation need to be revised to include specific requirements for closed, currently operating, and future facilities. In addition to manufacturing facilities, waste disposal sites, chemical storage facilities, and utility sites (e.g., power plants and wastewater treatment facilities) should also be included.”*





## What site investigation and remedial measures are done as a result of the legislative environment?

No defined approach or common understanding. Site investigations mostly driven by corporate governance of large multinationals operating in country and/or investigative methodologies developed by environmental practitioners embarking on projects.

## Are there legislated risk based screening values for the protection of groundwater?

- No

## Who is liable for groundwater contamination?

- No such liability legislation exists. Fines can be applied by the EEAA

## Is groundwater considered a receptor or pathway to contamination?

- Not defined as such. It is a receptor as per all water resources.



## Egypt



Are there legislated timeframes for the assessment and remediation of contaminated land/groundwater and regulatory interaction?

- No



# Conclusions & Summary



## Conclusions



1. Groundwater is an essential part of our lives and therefore should be protected
2. Vast array of legislation across the different jurisdictions. Generally developed countries have well established, detailed and implemented risk based strategies for the protection of groundwater.
3. Developing countries can learn from well established jurisdictions and adopt methodologies and frameworks for the management of contaminated land – i.e. don't reinvent the wheel



## The Way Forward for Developing Countries



1. Adopt a risk based approach to the remediation of groundwater by utilizing available and well implemented frameworks from other jurisdictions if not available locally
2. To ensure that contaminated groundwater is protected it needs to be assessed and therefore include site investigations at property transfer
3. Develop Tier I Groundwater Standards to facilitate rapid assessment of groundwater impacts and the need for further works
4. Consider unimpacted groundwater as a receptor and a pathway to ensure the sustainable development of this resource
5. Ensure that groundwater liabilities are well understood through delineation of contaminated groundwater plumes
6. Implement remedial measures where groundwater plumes are migrating irrespective of risk. Therefore, act early – if contamination is in the soil, limit its migration to groundwater, if already in groundwater, limit the spreading thereof
7. Legislate timeframes for authority consultation to ensure that groundwater pollution is dealt with timeously





# Thank you

