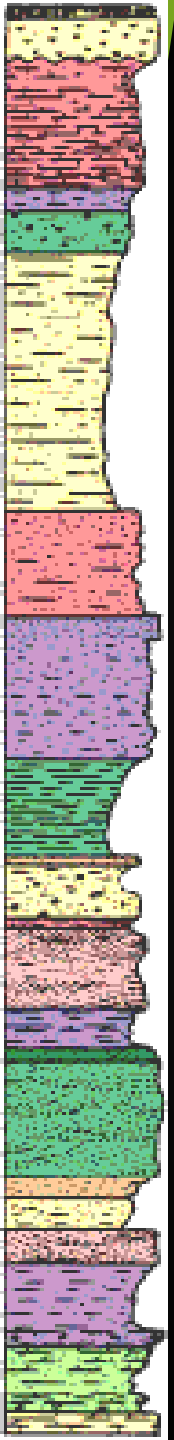

Risk Assessment and Risk Management Under Equator Principles

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Principles and Protocols of the World Bank, IFC, and Equator Principles EFIs

Over Past Decade Internationally Funded Projects Have Encountered Existing Contamination and Has Led to Issuance of EHS [Risk Assessment] Guidance for Contaminated Land

- Addresses Contamination of *All Environmental Media*
- Focus on Transparency in Redevelopment Projects

Equator Principles (EP)

- Equator Principles is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in project lending; similar to and references World Bank guidelines.
- This framework is intended to provide a minimum standard for ***due diligence*** to support responsible risk decision-making and bank loan management.
- Currently 87 Equator Principles Financial Institutions (EPFIs) in 36 countries have officially adopted the EP, covering over 70 percent of international Project Finance debt in emerging markets.
- Encountering Existing Contamination in Several Projects led to momentum to develop a standard guidance for “Contaminated Land”
- China recently issued a similar standard for its “Brownfield” Program

Environmental Risk Assessment Steps in GENERAL EHS GUIDELINES: ENVIRONMENTAL CONTAMINATED LAND

Similar to US EPA Superfund Guidance and Texas “Brownfield” Projects; International Funding Protocols Require:

- Basic ESA and Due Diligence following ASTM or similar standards
- Reporting of and Addressing Existing Contamination
- ***Risk Screening, and if required***
- Interim Remediation
- ***Detailed Risk Assessment***
- Selection of Remediation and Mitigation Goals, ***based on exposure pathways***
- Selection of Conceptual Approach
- Detailed Review of Remedial Technologies
- Selection and Implementation of Preferred Remediation Technologies and Plan

Risk-Based Remediation is Implemented in Context of World Bank Group or Equator Principles, including

- 1: Review and Categorization.....
- 2: Completion of Environmental and Social Assessment .....
- 3: Identifying Environmental & Social Standards ***[Risk Criteria]***
- 4: Developing and Implementing Environmental/Social Management System and Action Plan .....
- 5: Stakeholder Engagement .
- 6: Grievance Mechanism.....
- ***7: Independent Review .....***
- ***8: Covenants .....***
- 9: Independent Monitoring and Reporting .....
- 10. Reporting / Transparency

World Bank Group EHS Guidelines

- The World Bank Group Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with
  - Good International Industry Practice (GIIP).
  - They contain performance levels and criteria generally considered to be achievable at reasonable costs by existing technology.
  - Used by International Finance Corp (IFC).
- Following the 2012 update of IFC's Policy and Performance Standards on Environmental and Social Sustainability ,the World Bank Group decided to update their EHS Guidelines and are continually adding new Guidelines, for example, for Offshore Deep Water Petroleum Industry and Contaminated Land Guidance .

New Clarity in Equator Principles

- **The Equator Principles Association published a new document 'Equator Principles Implementation Note' with external stakeholders and other interested parties.**
- ***Funding can be discontinued and revoked if Funded Activities Fail to Comply with Risk-Based Cleanup Criteria***; Note provides examples to support the understanding of the requirements in, and implementation of, the Equator Principles.
- The document comprises a series of modules containing information to support the implementation of the requirements contained in the Equator Principles on scope, climate change (Principle 2 and Annex A of the Equator Principles) and reporting (Principle 5, 10 and Annex B of the Equator Principles),
- including reporting and addressing existing contamination.

Public Reporting & Transparency

- A summary of the Environmental and Social Impact Assessment and Operational Information is accessible and available online
- Public Reporting by the Borrower Is Required Annually for Most Projects, following internationally recognized methodologies and good industry practice, including
  - ***Progress Addressing Land Contamination with significant impacts***:
    - Site Investigations
    - Cleanup during Construction
    - Ongoing Remediation
    - Ground Water and Seepage Discharge Monitoring and Reporting of Data and
    - Risk Assessment Findings for each of the above !!

IFC Adopted US EPA Region 3 as example of RBC standards

- These may include the USEPA Region 3 Risk-Based Concentrations (RBCs). http://www.epa.gov/reg3hwmd/risk/human/index.htm.
- Country-specific RBCs are considered acceptable if they have been developed by governments using risk assessment techniques for use as general targets in the site remediation.
- Separate Remediation Goals (PRGs) are developed or adopted for soil, sediment or groundwater, and often a distinction is made between land uses (as noted earlier) because of the need for more stringent guidelines for residential and agricultural versus commercial/industrial land use.
- The RBC Tables contains Reference Doses (RfDs) and Cancer Slope Factors (CSFs) for about 400 chemicals. These toxicity factors have been combined with "standard" exposure scenarios to calculate RBCs--chemical concentrations corresponding to fixed levels of risk (i.e., a Hazard Quotient (HQ) of 1, or lifetime cancer risk of 1E-6, whichever occurs at a lower concentration) in water, air, fish tissue, and soil for individual chemical substances.
- The primary use of RBCs is for chemical screening during baseline risk assessment (see EPA Regional Guidance EPA/903/R-93-001, "Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening").

Alternative Risk-Based Cleanup Levels

- When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.
- If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for alternative criteria is required as part of the Site-Specific Environmental Assessment.
- This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.
- Based on actual opportunity for exposure and whether exposure pathway is or may become complete.
- Very similar to Texas Risk Reduction Program (TRRP) and various state Risk-Based Cleanup Assessment (RBCA) programs
- Allows Establishment of Management Areas Similar to Texas Program

Risk Assessment Process is Used to Guide and Select Remediation Required

- **When potential exposure exists for a complete pathway for current or foreseeable future conditions, the following steps should be followed:**
- **1) Risk screening;**
- **2) Interim risk management;**
- **3) Detailed quantitative risk assessment; and**
- **4) Permanent risk reduction [remediation] measures, including engineered controls, such as caps, recovery wells and subsurface cut-off or treatment walls or barriers.**
- **Often product recovery will pay for remediation !!**

Risk Assessment Process is Used to Guide and Select Remediation Required

- **Risk Screening is the "problem formulation" and entails the following steps:**
  - **• Identification of the location of suspected highest level of contamination through a combination of visual and historical operational information;**
  - **• Sampling and testing of the contaminated media (soils or water) according to established technical methods applicable to suspected type of contaminant57,58; •**
  - **• Evaluation of the results with international standards, EU or US standards.**
- **Verification of the potential exposure by *human* and/*or ecological receptors***
- **The outcome of risk-screening may reveal that there is NO RISK to human health or the environment.**

Immediate Action Required When Imminent Hazard (i.e. Threat)

- **Interim Risk Management Actions - should be implemented at any phase of the project if land contamination poses an “imminent hazard”**
- **Imminent Hazard = an immediate risk to human health and the environment if contamination were allowed to continue, for even a short period of time.**
- **Examples of situations considered to involve imminent hazards include, but are not restricted to:**
  - **• Presence of an explosive atmosphere caused by contaminated land**
  - **• Accessible and excessive contamination for which short-term exposure could result in acute toxicity, irreversible long term effects, sensitization, or accumulation of persistent bio-cumulative and toxic substances**
  - **• Concentrations of pollutants at concentrations above the Risk Based Concentrations (RBCs) or drinking water standards in potable water at the point of abstraction**
- **Appropriate risk reduction should be implemented as soon as practicable to remove the condition posing the imminent hazard.**

Detailed Risk Assessment Similar to Those in US

- ***Land Use***: An assessment of contaminant risks needs to be considered in the context of current and future land use, and development scenarios (e.g., residential, commercial, industrial, and urban parkland or wilderness use).
- ***Detailed Risk Assessment***: A detailed quantitative risk assessment builds on risk screening (problem formulation).
- ***Detailed Site Investigation***: Detailed Risk Assessment involves first, a detailed site investigation to identify the scope of contamination.
- ***QA/QC***: Site investigation programs should apply quality assurance/quality control (QA/QC) measures to ensure that data quality is adequate for risk assessment purposes (e.g., method detection limits are below levels of concern).
- ***Conceptual Site Model and Pathway Analysis***: The site investigation in turn should be used to develop a Conceptual Site Model of how and where contaminants exist, how they are transported, and where routes of exposure occur to organisms and humans. The risk factors and conceptual site model provide a framework for assessing contaminant risks.

Detailed Risk Assessment Similar to Those in US

- ***Risk Reduction Goals***: Human or ecological risk assessments facilitate risk management decisions at contaminated sites. Specific risk assessment objectives include:
  - • Identifying relevant human and ecological receptors (e.g., children, adults, fish, wildlife)
  - • Determining if contaminants are present at levels that pose potential human health and/or ecological concerns (e.g., levels above applicable regulatory criteria based on health or environmental risk considerations)
  - • Determining how human or ecological receptors are exposed to the contaminants (e.g., ingestions of soil, dermal contact, inhalation of dust)
- Cited Examples include processes defined by the American Society of Testing and Materials (ASTM) Phase II ESA Process; the British Columbia Ministry of Environment Canada (BC MOE) http://www.env.gov.bc.ca/epd/epdpa/contam_sites/guidance); and the Massachusetts Department of Environment http://www.mass.gov/dep/clean

When Remediation Required, Selection Follows a Stream-line US Approach

- ***Remedial Action Plan Technology Selection*** - If risk reduction is required, then determine where, and in what conceptual manner, risk reduction measures should be implemented
  - • Identifying the preferred technologies (including engineering controls) needed to implement the conceptual risk reduction measures
  - • Developing a monitoring plan to ascertain whether risk reduction measures are effective
  - • Considering the need and appropriateness for institutional controls (e.g. deed restriction, land use restrictions) as part of a comprehensive approach
- ***Permanent Risk Reduction Measures*** -The risk factors and conceptual site model provides a basis to manage and mitigate environmental contaminant health risks.
- ***Strategies*** - should be developed based on site-specific conditions, and the practicality of prevailing factors and site constraints.
- ***Remedial Action Plan*** - should include, whenever possible, contaminant source reduction (i.e., net improvement of the site) as part of the overall strategy towards managing health risks at contaminated sites, as this alone provides for improved environmental quality.

Remediation and Mitigation Options

- ***The Selected Approach*** - should take into consideration the technical and financial feasibility (e.g. operability of a selected technology given the local availability of technical expertise and equipment and its associated costs). Examples include
  - Limiting or preventing access to contamination (actions targeted at the receptor may include signage with instructions, fencing, or site security)
  - Imposing health advisory or prohibiting certain practices leading to exposure such as fishing, crab trapping, shellfish collection
  - Educating receptors (people) to modify behavior in order to reduce exposure (e.g., improved work practices, and use of protective clothing and equipment)
  - Providing an alternative water supply
  - • Capping contaminated soil with at least 1m of clean soil to prevent human contact, as well as plant root or small mammal penetration into contaminated soils
  - • Paving over contaminated soil as an interim measure to negate the pathway of direct contact or dust generation and inhalation
  - • Using an interception trench and/or pump and treat technologies to prevent contaminated groundwater from discharging into fishable, swimmable streams

Remediation and Mitigation Options

- ***For Soil, Sediment, and Sludge***:
  - In situ biological treatment (aerobic or anaerobic) o In situ physical/chemical treatment (e.g., soil vapor extraction with off-gas treatment, chemical oxidation)
  - In situ thermal treatment (e.g., steam injection, phase heating)
  - Ex situ biological treatment (e.g., excavation and composting)
  - Ex situ physical/chemical treatment (e.g., excavation and stabilization)
  - Ex situ thermal treatment (e.g., excavation and thermal desorption or incineration)
  - Containment (e.g. landfill)
  - Natural attenuation
  - Other treatment processes

Remediation and Mitigation Options

- ***For Groundwater, surface water, and leachate:***
  - In situ biological treatment (aerobic and/or aerobic)
  - In situ physical/chemical treatment (e.g., air sparging, zero-valent iron permeable reactive barrier)
  - Ex situ biological, physical, and or chemical treatment (i.e., groundwater extraction and treatment)
  - Containment (e.g., slurry wall or sheet pile barrier)
  - Natural attenuation
  - Other treatment processes

Remediation and Mitigation Options

- ***For Soil Vapor Intrusion***:
  - Soil vapor extraction to reduce VOC contaminant source in soil
  - Installation of a sub-slab depressurization system to prevent migration of soil vapor into the building
  - Creating a positive pressure condition in buildings
  - Installation (during building construction) of an impermeable barrier below the building and/or an alternative flow pathway for soil vapor beneath building foundations (e.g., porous media and ventilation to shunt vapors away from building)

Case Study: Bahamas Former Refinery & Terminal

- Certification of whether in relation to the Project there are any: i. past or existing adverse risks or impacts relating to [Environmental or Social Matters] that have not been addressed by one or more [Corrective Action Plans], or ii. known or threatened [Environmental or Social Claims]
- Study of Bay, Reefs, and Sensitive Habitat Quality and Monitoring
- Study of Water Quality, Soil, Ground Water, LNAPL plume,
- Modeling of Potential Spills and Effectiveness of Alternative Response Measures
- Enhanced Spill Prevention and Response Program, with staged equipment and dispersants
- Monitoring and Modelling of air quality
- Engagement and Transparency with Stake Holders
- Involvement of Universities and NGOs
- Mitigation and Remediation Plans, including LNAPL Recovery and Ruse Program
- Waste water treatment plan
- Detailed design and cost estimation of upgrades required to protect surface water, soil, ground water, and air quality
- Local social impact plan including upgrade of education, training, hiring, and upgraded public housing.

Case Study: Bahamas Former Refinery & Terminal

Remediation Plan that entailed:

- Source Control and Corrective Action Management Area
- Effectiveness and Threat Monitoring Program with Quarterly and Annual Reporting
- Public Reporting and Transparency with University involvement
- Integration of Investigation and Mitigation Measures into Demolition decommission plans and facility O&M plans, including personal safety and air monitoring during construction activities with potential reuse of affected soils in asphalt
- Establishments of Alternative Cleanup Levels for Soils based on Texas distilled water leaching tests
- Alternative ground water protection standards based on assimilative capacity of ground water and receiving streams
- Detailed design and cost estimation of upgrades required to protect surface water, soil, ground water, and air quality
- Third Party monitoring and certification.

Conclusions

- Equator Principles have incorporated US Risk-Based site characterization, risk assessment, and remediation standards into international lending and financing agreements for redevelopment projects
- Roles for Sponsor and Third-party site assessors and monitors
  - Initial due diligence
  - Site investigations
  - Construction monitoring
  - Risk assessments
  - IFC or EPFI funded remediation
  - Continuing remediation monitoring and risk evaluations
- Opportunities for US-based companies to expand internationally

Questions and Answers

- Thank you for this opportunity to share with you my perspective and what I have been fortunate to have learned