

# Integrating Environmental Management, Compliance and Geotechnical Engineering with Civil Projects

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# Introduction

- The physical evidence of our country's economic activity is our infrastructure and our build environment.



# Introduction

- However the parts of these projects we see and interact with - the visible part we identify with iconic events in our history and economic development are only part of the story.





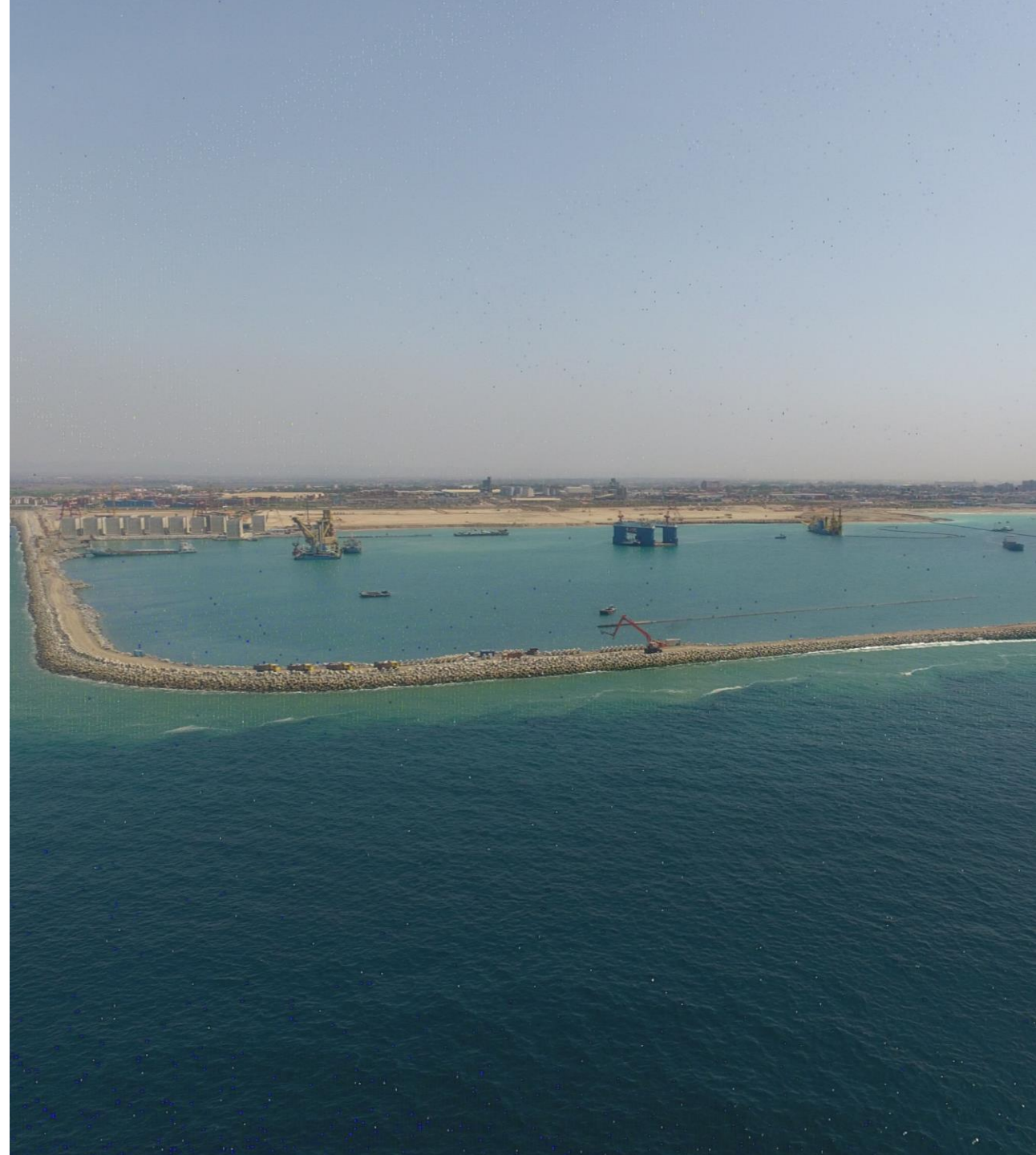
# Introduction

- Behind the success of these projects and part of their legacy, not visible is the final product are the components of:
  - *securing of the sustainability of the environment;*
  - *securing good social outcomes;*
  - *physical interactions with the subsurface foundation.*



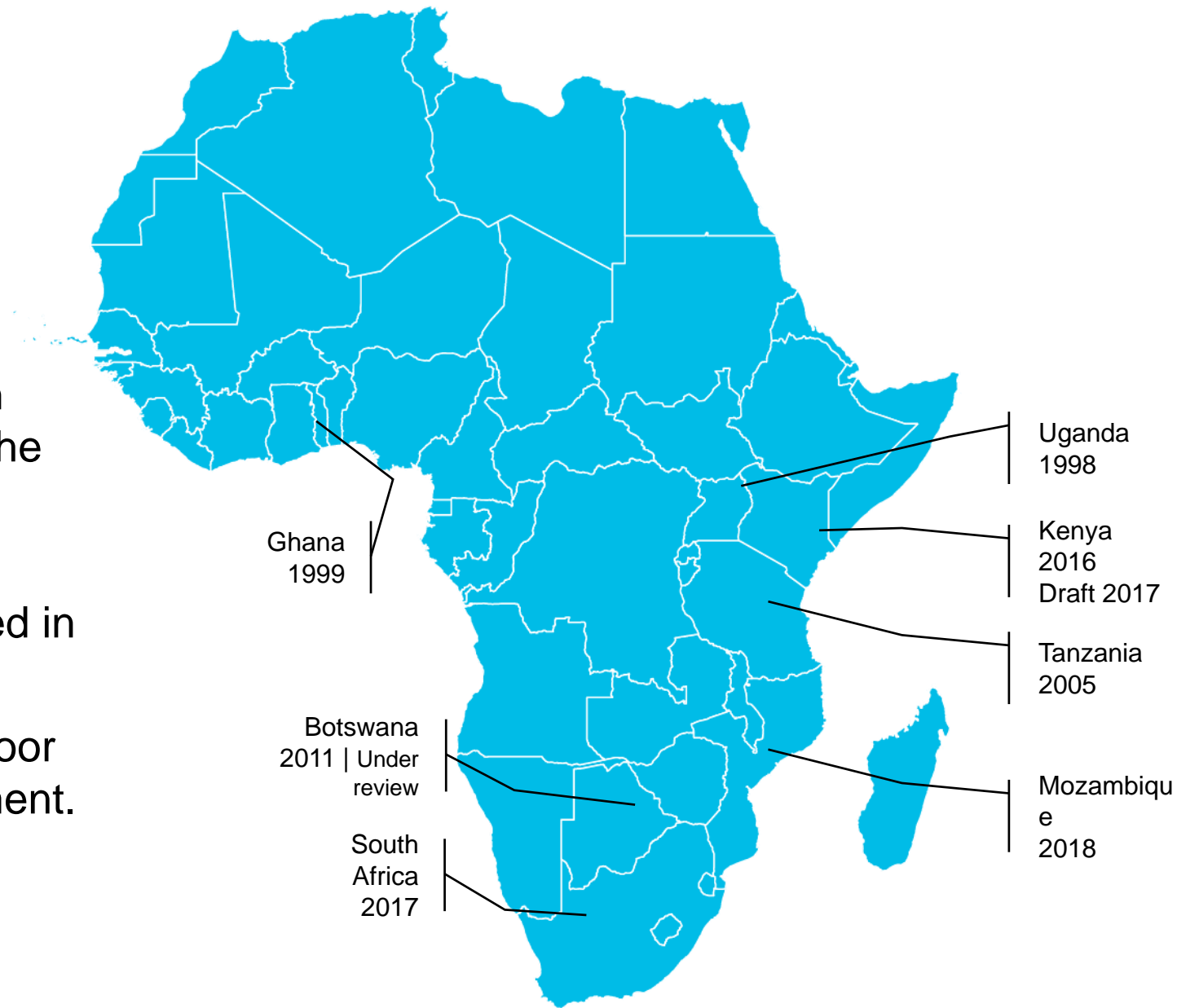
# Introduction

- Represents as much as 15% of the total project costs.



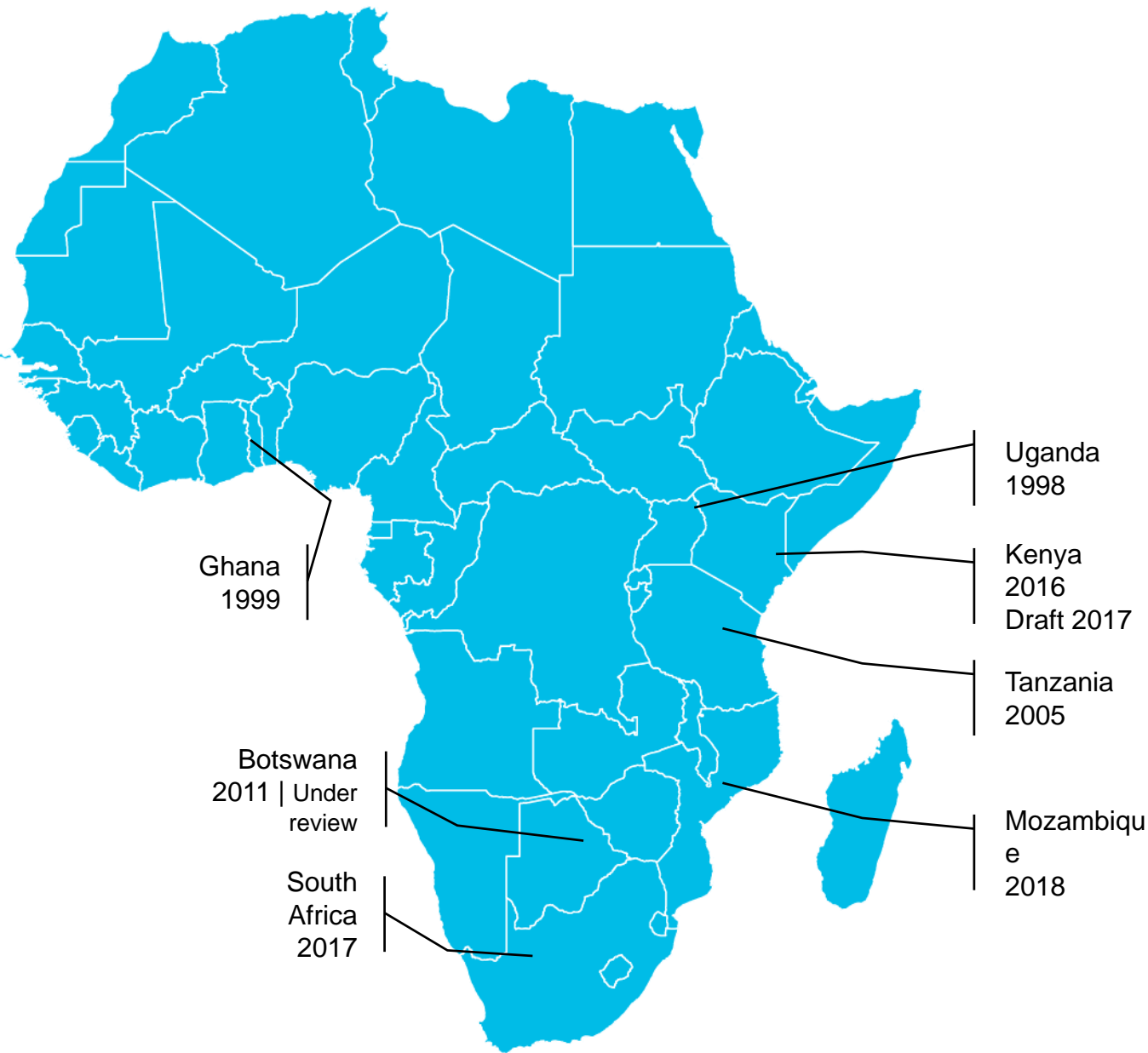
# The Environment in Africa

- Project development aims to achieve a balance between the positive impacts on infrastructure expansion and impact on the natural and social environments.
- In reality it is the physical environment, without a voice, that is often compromised in the balance.
- In most of Africa this occurs not due to poor legislation but because of poor enforcement.



# The Environment in Africa

- Increasingly, international funding agencies are involved in funding or part-funding these major infrastructure projects. This funding is contingent on the stringent enforcement of international best practice for both Environmental and Social Impact Assessment and the Implementation of the Environmental Management Plan.
- AECOM's core strength is advising clients on lender requirements and reviewing projects to lender standards.
- Outcome is that governments are strengthening their environmental legislation and enforcement as the exposure to these large internationally funded projects continue.





# The Environment in Engineering Design and Construction

- In the past ESIAs have been used as a pre-feasibility check box and almost always in complete isolation of engineering input.
- AECOM's core differentiator is full consideration of environmental design optimisation and maximising mitigation through all phases of the project.
- Designers work closely with Environmental Engineers to mitigate these risks in the design phase.
- No costly time delay surprises during the design and construction phases of the project.





# Acid Mine Drainage project

- Received unprecedented approval at Scoping Phase due to the extensive research done on the risks and mitigation.
- Facilitated design to consider environmental impacts.
- Construction supervision to ensure compliance to design requirements





# Tema Port Development - Environmental Management

- Environmental and Social Management System (ESMS) that aligns regulatory, contractual and lender (e.g. IFC) requirements.
- Assist and monitor contractor to perform duties compliant to regulatory, contractual (AECOM's) and lender (e.g. IFC) requirements.
- Upskilling of local (Ghanaian) environmental representative.





# Environmental Clean-Up Remediation

- Liability for contamination remains with the land owner in South Africa.
- Risk based legislation for environmental contamination since 2004.
- Most of the rest of Africa no or non-risk based legislation.
- Limited implementation.
- Big international Oil&Gas, Mining and Industrial clients committed to remediation.
- AECOM has the largest remediation consulting practice in the world





# Remediation

- Defining the problem.
- Designing treatment plant and system.
- Installation of system.
- Ongoing monitoring





# Ground Engineering – part of integrated delivery

- All infrastructure interacts with the ground.
- Geology, climate and geomorphology influence material properties.
- Material properties dictate the foundation solutions.
- Most effective solutions occur when an engineering geologist works closely with a geotechnical engineer and the structural engineer.
- Understanding of uncertainty and quantification of soils structure interface.





# Integrated Design

- Lateral support
- Ground improvement
- Numerical modelling
- Pile design
- Foundations design
- Blast design
- Excavation below water table
- Slope stability
- Underground excavation







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