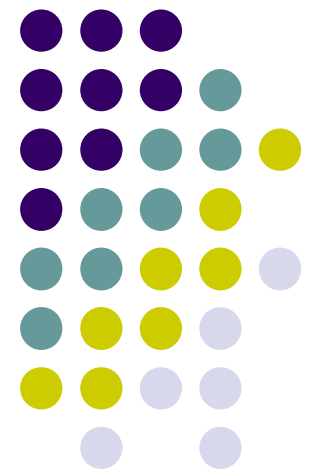
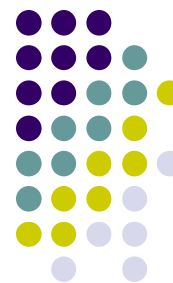


Road Network Development Sector Project In Timor-Leste

Chen Chen
Infrastructure Specialist, PARD
Asian Development Bank

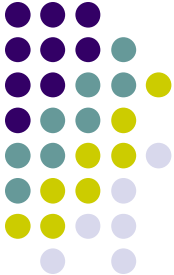


Contents

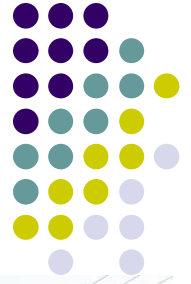


- The Facts of Timor-Leste
- Road Network Development Sector Project
- The Challenge of Climate Change
- Climate Change Impact and Vulnerability Assessment
- The Economics of Adaptation in Road Project
- Project Formulation and Engineering

The Democratic Republic of Timor-Leste



Road Network Development Sector Project



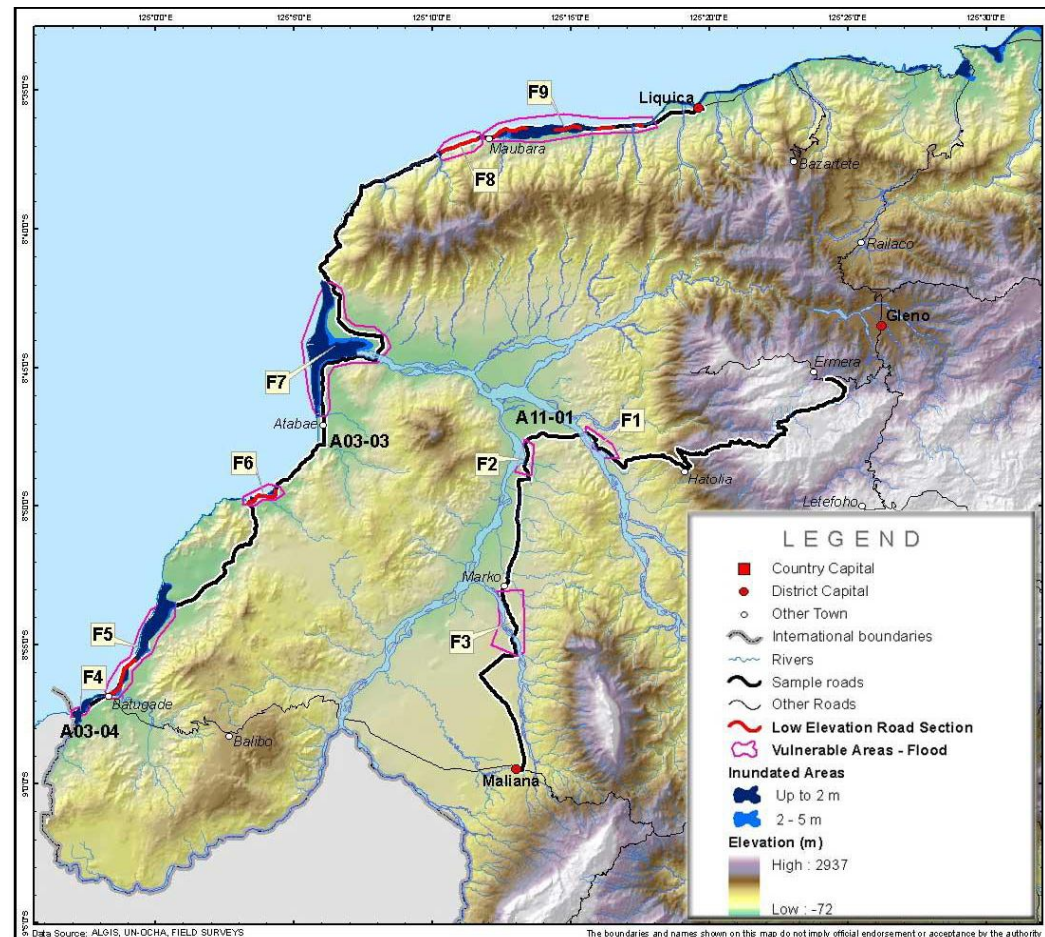
- The \$46 million ADF grant was approved in November 2009.
- The Project will improve access to social and economic facilities in the project areas, and make the road network less vulnerable to severe climate events.
- Two sample roads were selected for feasibility studies during the project processing.
- The Execution Agency is Ministry of Infrastructure.



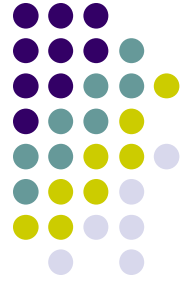
Potential Challenges of Climate Change to Timor-Leste's Road Network



- Changes in duration and intensity of seasonal rains
- Changes in very hot days and heat waves
- Sea level rise
- Changes in intensity of and frequency of precipitation events and flood patterns
- Changes in seasonal precipitation and flooding pattern
- Changes in cyclone intensity, frequency, and duration, and associated storm surge and wave action
-



Climate Change Impact and Vulnerability Assessment



Modeling Climate Change

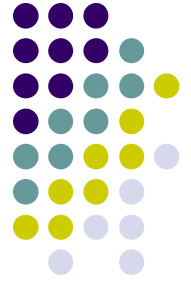
(top-down)

- Analysis of Time & Resources
- Review & Synthesis of Literature
- Climate Change Scenarios
- Downscaling to the Project Level
- Assessing Response of Natural Systems
- Assessing Response of Social Systems
- Development of Planning Scenarios
- Assessment of Uncertainties

Ground Truthing (bottom-up)

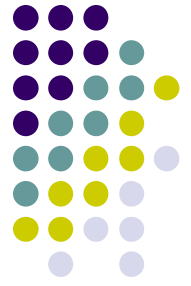
1. Vulnerability Mapping
 - Digital Elevation Model (DEM)
 - Geotechnical Data
 - Geotechnical Stability Zone
 - Environmental Survey
 - Historical Rainfall Data
2. Community Consultation
 - Ground Level Verification of Climate Change Trend
 - Adaptation options practiced or planned by the communities

Key Findings of Impact and Vulnerability Assessments



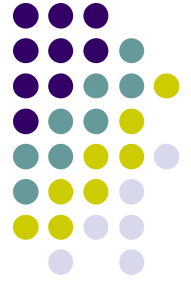
- +0.8°C warming to 2020, +1.5°C warming to 2050
- Wetting, mainly during rainy season 2% by 2020 and 4% to 2050
- More intense short duration precipitation
- Flood intensity expected to increase significantly
- Expected wave height and action to worsen coastal erosion and floods
- Sea-level rise 1.9mm/yr to 5.8mm/yr
- Greater frequency of heat waves

Engineering Adaptation Measures



- Increased storm surge wave height and sea level rise
 - Erosion Protection
 - Increased maintenance
 - Realignment (when?)
- More intense short duration precipitation
 - Increased capacity of transverse drainage system
 - Improved longitudinal drainage
 - Erosion protection
 - Increased maintenance

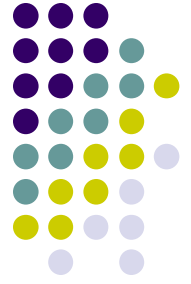
Bioengineering Adaptation Measures



- Re-forestation/re-vegetation on unstable slopes
- Application of vegetated erosion control blankets
- Stone-filled nettings (i.e. chamber revetments)
-

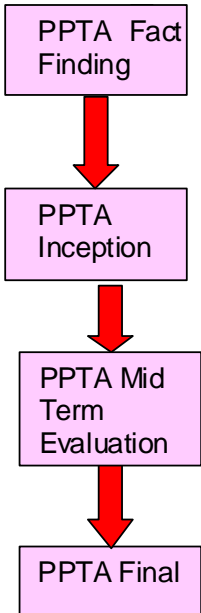
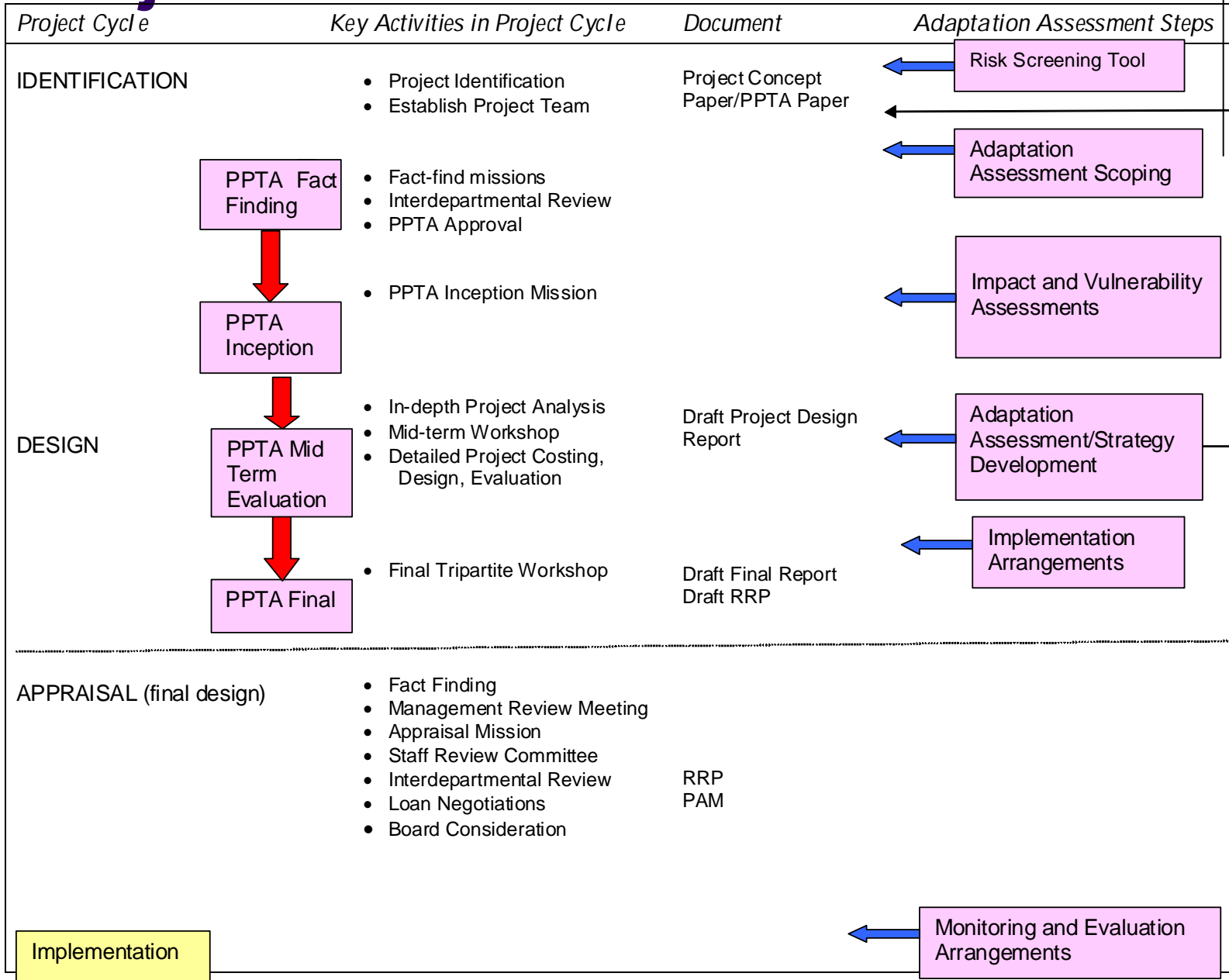
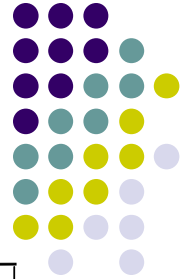
Bioengineering measures and maintenance program can be well implemented through a community participation program with benefits of inclusive development in the corridor areas.

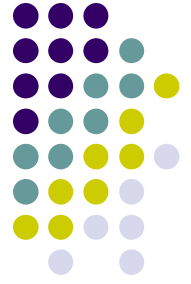
The Economics of Adaptation in Road Project



- Analysis Period: Is a longer analysis period more reasonable in the economic assessment of climate change adaptation?
 - 20 or 50 years?
- Interest Rate: Is the 12% interest rate over-conservative for a long analysis period?
 - 12% or 3-5%?
- Benefits of Climate Change Adaptation
 - Agency Benefits: Reduced maintenance/ rehabilitation investments
 - Social Benefits: Increased value of commercial agriculture products; employment generation; improved access to socioeconomic facilities.
 - Environmental Benefits
 - Road Safety Benefits

Project Formulation





Next Steps

- A toolkit for climate change impact and vulnerability assessment
- A economic analysis model with major benefits and costs quantified
-

The supports of RSDD in the project processing are acknowledged.