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Port of Manzanillo: Climate Risk Management

IDB and API Manzanillo Technical Cooperation

Inter-American Development Bank (IDB) and **Integral Port Administration of Manzanillo**, S.A. of C.V. (API Manzanillo) Technical Cooperation ME-T1239:

- Evaluate climate-related risks and opportunities for the Port
- Identify actions to reduce medium- and long-term risks
- Develop Climate Change Adaptation Plan

- Major Mexican port in containerised cargo with a Dynamic capacity >2 million TEUs
- 14 terminals under concession, managed by private investors
- Maintains active trade relationships with over 14 countries worldwide.

ACCLIMATISE building climate resilience
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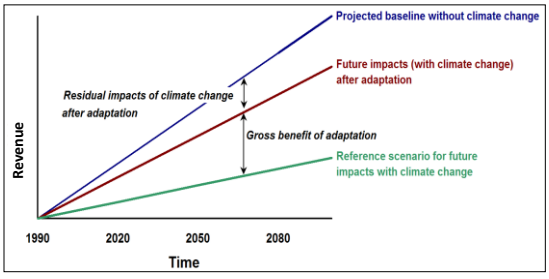
CONSULTORIA TECNICA, S.C.
SCT SECRETARÍA DE COMUNICACIONES Y TRANSPORTES
MANZANILLO COORDINACIÓN GENERAL DE PUERTOS Y MARINA MERCANTE
IDB

Overview of methodology

- Risk-based adaptation decision-making
- Value-chain approach
- Financial analysis of risks
- Cost-effectiveness of adaptation measures
- Aligment with climate change adaptation policy guidelines

Schematic of Port of Manzanillo value chain



Overview of approach to financial analysis

- Financially optimal?
- Timing of adaptation investments?
- Actions needed by/with other stakeholders

Climate, hydrological and oceanographic conditions

Future changes in mean temperature

- Warming at Manzanillo (relative to 1979-2000) under RCP 8.5 is around 1°C in 2020s and 2°C by 2040s

Future changes in seasonal rainfall

- Mean rainfall projected to decrease in both wet and dry seasons
- Expected increase in extreme rainfall

Hydrology

- Likelihood of flooding event is estimated to almost double by 2050

Observed Sea Level

- If this observed rate of sea level rise continues (of 3.3mm per annum) then sea level may rise by 0.12m by 2050 (0.28m by 2100)

Element of value chain	Effects of climate changeon different aspects of port´s value chain
Goods storage	Increased temperature, dust and flooding can affect storage of goods
Goods handling	High winds, extreme rainfall and lightning can affect crane operations
Equipment, buildings and infrastructure	Intense rainfall events, storms and wind speeds can damage infrastructure
Maintenance requirements	Coastal and riverine erosion driven by high rainfall events and extreme wind speeds may result in greater accumulation of sediments.
Port services	Reduced precipitation may result in lower water flows, hindering navigability in rivers, lakes and channels and affecting port access
Trade routes	Maritime shipping can be disrupted by major storm events
Environmental performance	Effect on vulnerable ecosystems at / in the vicinity of ports; Impacts on air quality (e.g. dust) may require ports to undertake additional actions
Social performance	Health / safety of workers affected by more extreme climatic conditions and relationships between port and local community can be affected
Demand & consumption	Impacts of climate change on economies of trading partners can affect trade flows at ports

Risk Prioritization

1.Current vulnerability is high

2.Projected impacts of climate change are large

3.Adaptation decisions have long lead times or long-term effects

4.Large uncertainties - scale of future risk is uncertain but could be large

→ Risk rated 'high' against two or more criteria ⟶ high priority risk

→ Risks where current vulnerability rated 'high' ⟶ high priority risk

Summary of financial impacts (1)

Surface water flooding

- Flooding damage is costly for API Manzanillo
- 6 million MXN in maintenance costs for roads/customs in 2015.
- Future increase in maximum tropical storm intensity
- Greater flooding events = greater damage
- Extra 3 million MXN per year for maintaining internal roads/customs area by 2050 (based on 8% increase in rainfall intensity)

Manzanillo post Hurricane Jova 2011. (Source: API Manzanillo).

Clearing mangrove channel post Hurricane Bud 2012. (Source: API Manzanillo).

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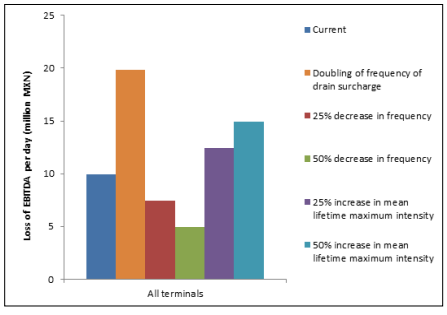
Summary of financial impacts (2)

Increased surface water flooding

- Average present-day downtime for terminals is 1 to 2 days per year, every other year
- Equates to average annual loss of EBITDA of around 9.9 million MXN.
- Sensitivity analysis shows effect of:
  - Doubling of frequency of drain surcharge
  - Four other changing storm scenarios
- Surface water flooding can be viewed as a port closure issue for API Manzanillo
- Average costs of port closure for API Manzanillo are 0.12% of annual income per 24 hours of closure



Average annual loss of EBITDA across all terminals due to surface flooding of port access road and railway, under various flooding scenarios (Source: Report authors)

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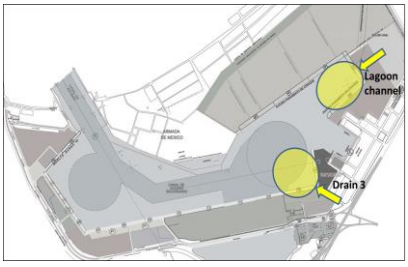
Summary of financial impacts (3)

Sedimentation and terminal access

- Sedimentation reduces draft clearance close to the quays
- Presence of dredging vessel also disrupts terminal operations e.g. 50 % more time to unload for TIMSA
- Delays due to dredging vessel presence for all terminals = 234,000 MXN per hour



Areas of higher sedimentation at the port

1. **Increased requirement for maintenance dredging**
   Additional 864,000 MXN per year by 2050
2. **Increased drain maintenance/clearance**
   Additional 1.6 million per year by 2050
3. **Impacts of increased dredging activities on vessel access to terminals**
   8% increase by 2050.

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Summary of financial impacts (4)

Risks with significant financial impacts for whole port

- Increased surface water flooding of the port entrance\access road
- Increased sedimentation of the port basin

If no action is taken

Significant financial impacts will be borne by both API Manzanillo and the terminals

But no risk to long-term continuity of business (2050s to 2080s)

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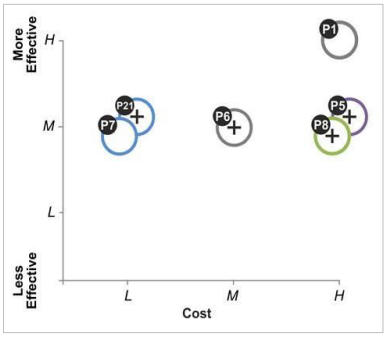
Risk area for port	Adaptation objective	Adaptation measure	Type	Cost	Effectiveness	Lead entity
DAMAGE TO INFRASTRUCTURE, BUILDING AND EQUIPMENT	Increase resilience to floods and intense rainfall events	P1 Upgrade drainage system inside the port to increase maximum capacity and handle increased flow.		H	H	API Engineering
		P2 Retrofit infrastructure or assets that are vulnerable to flooding, in particular critical infrastructure (e.g. insulate electrical equipment, use water resistant materials)		L	M	API Engineering
		P3 Engage with stakeholders to plan landscape level flood management options		No regret		API Engineering, API Ecology
		P4 Review early flood warning systems and identify areas for improvement in light of increased risk due to climate change		No regret		API Engineering, API Ecology
		P5 Review options for using sustainable drainage systems (SUDS) taking into account potential for changes in precipitation		H	M	API Engineering, API Ecology
		P6 Upgrade and improve sediment traps		M	M	API Engineering
		P7 Undertake review and adjust maintenance program to ensure that maximum capacity of existing drainage system is being achieved e.g. frequency of drain clearance		L	M	API Engineering
		P8 Consider catchment level landscape planning and ecosystem based adaptation options for reducing risk of drainage overflow		H	M	API Ecología

Cost effectiveness of adaptation measures

- High level analysis of cost effectiveness of operational and physical adaptation measures conducted
- For example surface water flooding adaptation measures:



Cost effectiveness of adaptation measures for surface water flooding.
(Source: Report authors)

P1 Upgrade drainage system inside port

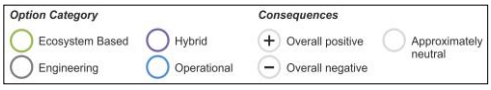
P5 Install sustainable drainage systems (SuDS)

P6 Upgrade and improve sediment traps

P7 Review and adjust maintenance program for drainage system to ensure maximum capacity is achieved e.g. frequency of drain clearance

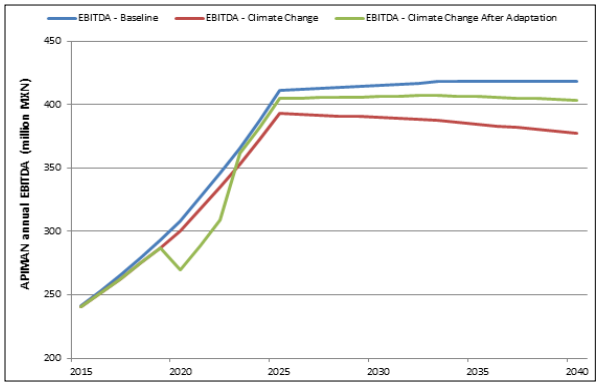
P8 Catchment level landscape planning

P21 Implement traffic management measures to minimize bottlenecks during flood events



Detailed analysis - upgrade drainage system (1)

- Upgrading maximum capacity of the drainage system and installing additional sediment traps will reduce surface water flooding and sedimentation
- Study assessed financial performance of these two measures:
  - Upgrade Drain 3 – costs 93 million MXN
  - Additional sediment trap in all drains – costs 7 million MXN



Effects of drainage-related climate change impacts and upgrades to drainage system on API Manzanillo's annual EBITDA (2015 MXN)

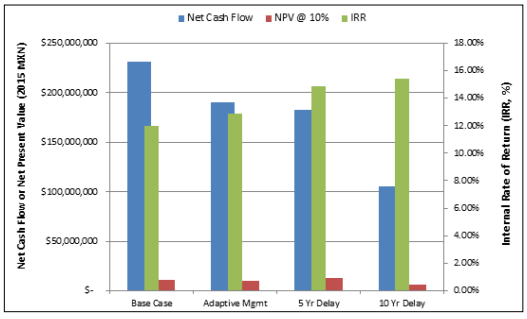
Detailed analysis - upgrade drainage system (2)

- Four scenarios for implementation of adaptation measures analyzed to explore how finances are affected by completing projects in phases or delaying projects

Scenario	Sediment trap installation	Drain 3 upgrade
Base case	Takes place over 3 years from 2016 to 2018	Takes place over 3 years from 2020 to 2022
Adaptive management	Takes place in 3 phases, in 2016, 2018 and 2020	Takes place in 3 phases in 2021, 2025, and 2029
5 year delay	Takes place over 3 years from 2021 to 2023	Takes place over 3 years from 2025 to 2027
10 year delay	Takes place over 3 years from 2026 to 2028	Takes place over 3 years from 2030 to 2032

Detailed analysis - upgrade drainage system (3)

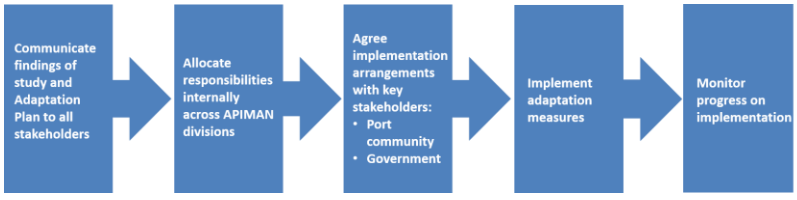
- Drainage system adaptation investments are shown to be financially worthwhile
- Costs of implementation not large compared to API Manzanillo's overall annual OPEX
- **Implementation scenarios where investments are delayed lowers net cash flow (because it leaves the port exposed to climate change impacts for longer) but improves the rate of return on the investment**



Comparison of financial performance of adaptation implementation scenarios for upgrades to drainage system. (Source: Report authors)

Next steps

- API Manzanillo and the terminals to:
  - consider measures proposed
  - decide which to implement and when - in discussion with other stakeholders



Source: Report authors

- Actions taken:
  - API has incorporated the Adaptation Plan into the Port's Risk Matrix
  - SCT now requests the APIs to have detailed risk matrices in place for evaluation
  - Climate Change is listed under E&S risks and API divisions (engineering, operations etc.) have to integrate it in their activities
  - Negotiations with Mexico's Finance Secretariat are underway to ensure funds can be allocated for API's new infrastructure and O&M activities following the Adaptation Plan

Impacts of Hurricane Patricia

Hurricane Patricia

•Strongest hurricane on record in the North Pacific and North Atlantic basins
•Hit the port of Manzanillo on October 23, 2015
•Forced the closure of the Port for 40 hours
•Operational impacts not significant – total cost estimated at 0.20% of the annual income of 2015
•The Adaptation Assessment and plan was delivered on June 2015 and hence the Port only had 4 months which was not sufficient to act on recommendations.

http://www.abc.net.au

Concluding remarks

When API Manzanillo and the terminals have implemented adaptation measures, the port will be well-positioned to cope with impacts of a changing climate on its value chain, in the near term and over the coming decades

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Stakeholder engagement

- Adequate engagement of stakeholders is a critical factor for implementation.
- Helps identify synergies in adaptation objectives and avoids conflicts.
- Effective engagement relies on the ability to:
  - Identify stakeholders to be engaged
  - Understand their roles and responsibilities
  - Communicate and engage in ways that are relevant and beneficial to them
- Key stakeholders for the Port of Manzanillo's Adaptation Plan include:
  - Port community: Terminals; Shipping lines; Logistics operators; Unidad Municipal de Protección Civil
  - Government: SEMARNAT; INECC; SCT; CONAGUA; IMADES; Ayuntamiento de Manzanillo;