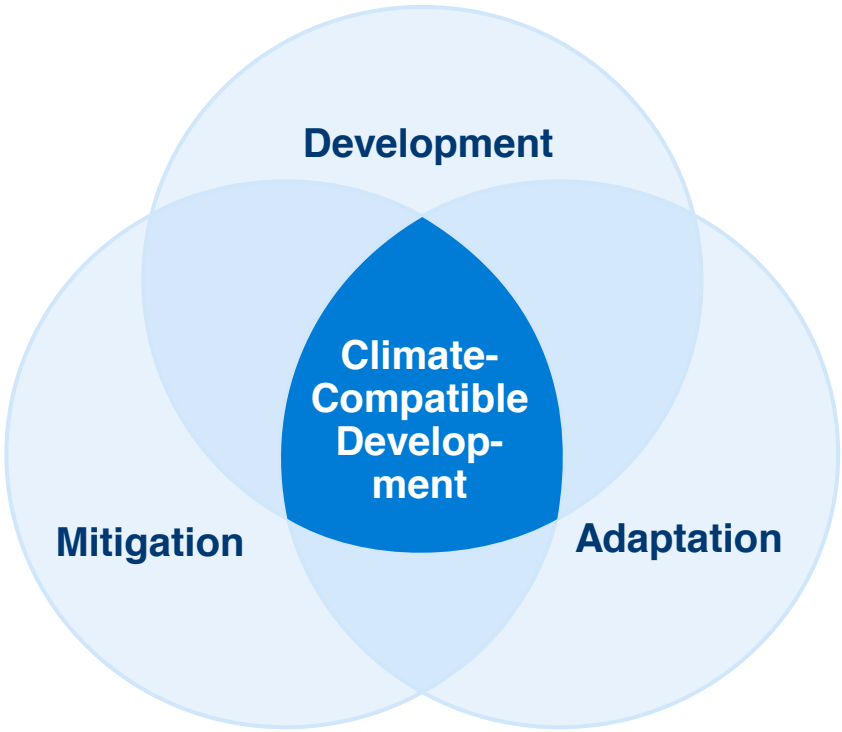
Papua New Guinea's plan for Fast Start Actions

July 2010

Office of Climate Change and Development
Papua New Guinea

PNG has developed a Climate-Compatible Development Plan

Strategic framework



Economic Development

- Achieve GDP per capita of USD 3,000 by 2030, as set out in our Vision 2050

Mitigation

- Potential to reduce emissions of green-house gases, by at least 50% by 2030 driven mainly by abatement measures in land use, land-use change and forestry
- Become carbon neutral by 2050, investing into low-carbon infrastructure today

Adaptation

- Reduce vulnerability to climate change-associated risks
  - Gradual hazards (e.g., disease)
  - Event-driven hazards (e.g., landslides, coastal flooding)

SOURCE: PNG Climate-Compatible Development Plan, OCCD analysis

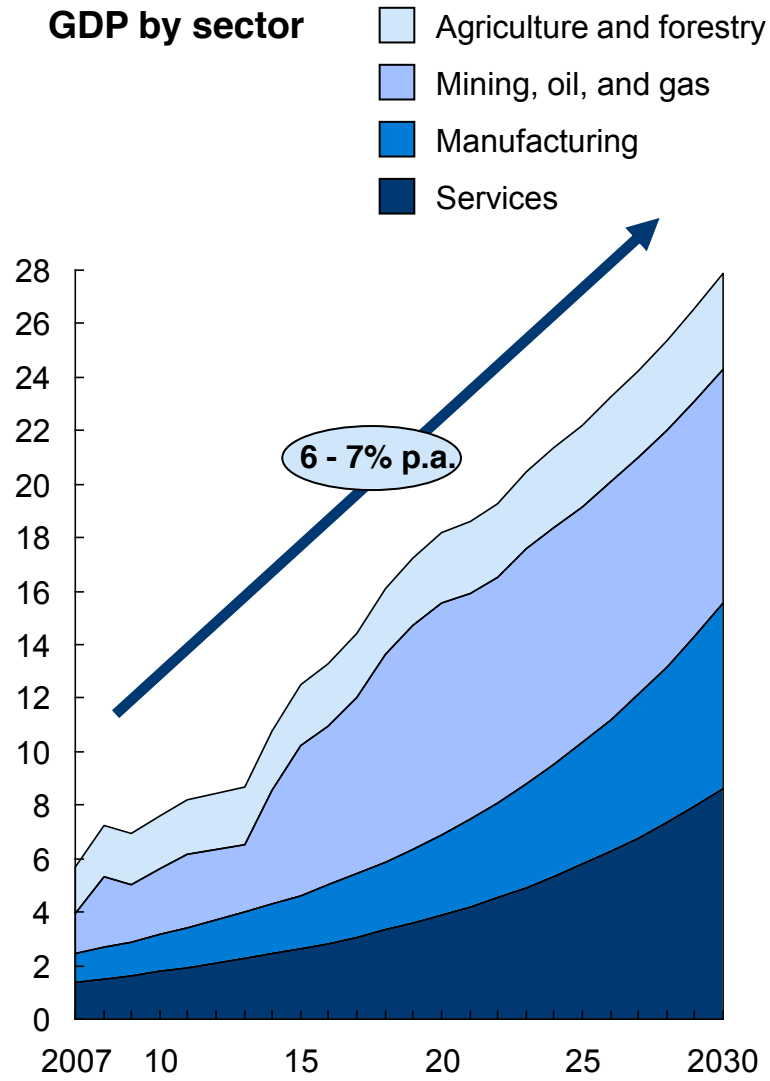
Low-carbon growth is also compatible with GDP growth of 6 - 7% p.a.

Substantial change from business as usual to low-carbon growth

Assumptions for growth by sector

Agri-culture and forestry	Food crops	**2% yield growth p.a.**
	Palm oil	2% yield, 5 - 6% area
	Coffee	2% yield p.a.
	Cocoa	2% yield p.a.
	Forestry	**Changes in practices**
Mining, oil, and gas	Gold	Double production by 2020
	Copper	Double production by 2020
	Nickel	Double production by 2020
	Oil	Gradual decline
	Gas	Open 2 plants (2013, 2017)
Industry	Manufacturing	6 - 8% p.a.
	Construction	7 - 9% p.a.
	Power	**12% hydro and solar**
Services	Retail	6 - 8% p.a.
	Transport	6 - 8% p.a.
	Telecoms	6 - 8% p.a.
	Tourism	**9 - 12% p.a.**
	Financial services	6 - 8% p.a.

GDP by sector



SOURCE: Vision 2050; DNPM; IMF; Low-Carbon Growth Technical Working Group

Logging and agricultural expansion cause significant emissions

Driver of emissions	2010 emissions[1] Mt CO_2e	Description
 **Timber harvesting**	68-69	▪ Logging results in significant deforestation and degradation, mainly in lowlands and islands
 **Subsistence/ smallholder agriculture**	28-43	▪ Population increase leads to expansion of agriculture area into forest
 **Agriculture leases[2]**	10	▪ Clearing of forest for 'agriculture leases' with high risk of being abused for timber extraction
 **Commercial agriculture**	4	▪ Clearing of forest to establish commercial plantations, predominantly oil palm
 **Mining, infrastructure**	4	▪ Historically biggest driver but mainly due to forest dieback from tailings mismanagement
 **Fire**	2	▪ Caused by humans (hunting, spreading from subsistence burning) and lightning
 **Everything else**	4	▪ Emissions from oil and gas production, transport fuel and power generation

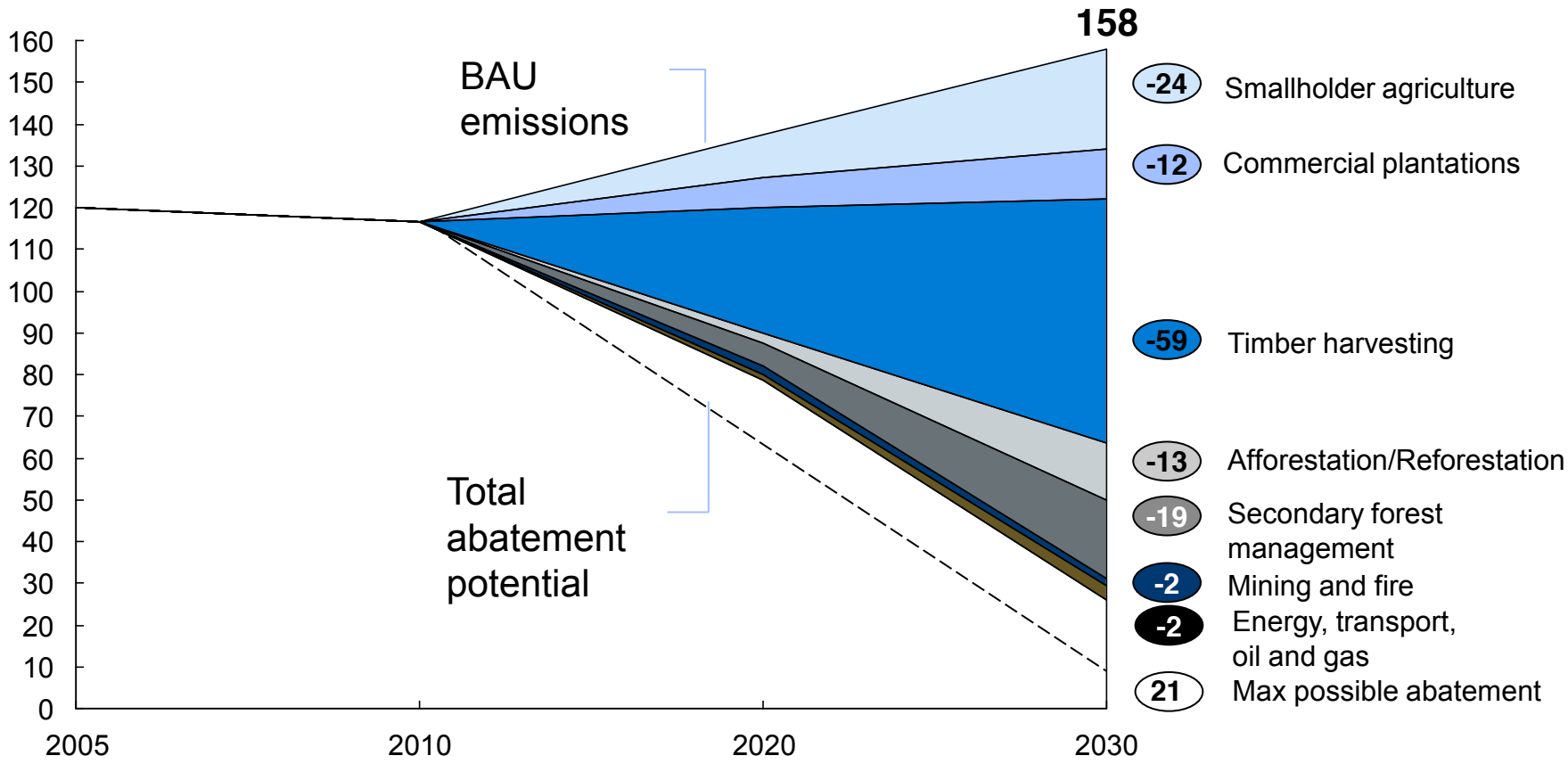
1 Estimate of 2010 extrapolated from 2008/09 data
2 Exact emission for 2010 still to be verified based on monthly log export reports

SOURCE: Shearman et al (2008, 2009, 2010); Fox et al (2010); Hunt (2010); REDD+ technical working group

Emissions reductions from most ambitious option

Emissions under ambitious option

Mt CO_2e/ year, 2005-2030



SOURCE: Expert interviews, REDD+ technical working group

Clear mitigation and adaptation priorities

Focus

Pilots and programs

REDD+

- Review of agriculture leases
- Locate palm plantation on non-forest land
- Afforestation/reforestation programs
- Secondary forest management
- Reduced impact logging

Adapta-tion

- Mangrove planting to protect coastal villages
- Coastal early flood warning system
- Coastal engineering
- Inland flood warning

Low-carbon growth

- Renewable energy for Port Moresby, national capital
- Rural electrification via rehabilitation of existing and new micro hydro plants
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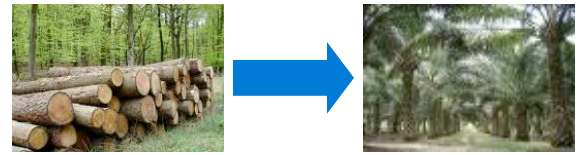
Examples

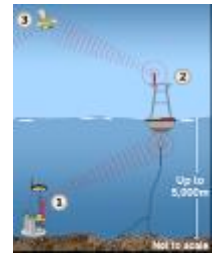
Review agricultural leases

- Review policy process and legal status of agricultural leases
- Explore ways to revoke existing leases, protecting up to 670,000 ha of primary forest



Coastal early warning system

- Automate detection of sea level changes that cause flooding
- Alert affected communities directly via SMS so they have time to avoid danger



SOURCE: PNG Climate-Compatible Development Plan, OCCD analysis

Overview of PNG's REDD+ potential

- PNG seeks to reduce emissions by approximately **17 % by 2015 using 2010** estimates as a reference level (16.5% below BAU)
- PNG could reduce GHG emissions:
  - by over 110 Mt CO2e between 2011 and 2015
  - at annual volume of **100 - 145 Mt CO2e** by 2030
  - by **1.1 - 1.5 Gt CO2e** cumulatively up to 2030
- PNG's abatement program requires **USD 715 million to USD 1 billion** in resources from 2011-2015:
  - USD 71 million for readiness payments
  - USD 118 million for pilot program costs
  - USD 526 – 811 million for performance based payments
- Estimated carbon costs of ~**USD 7.2 – 8.5 per t CO2e**
- PNG is ready to act
  - PNG is committed to its climate compatible growth plan and has identified tangible fast start action
  - Political leadership and land-owners are committed to find new and creative land-use solutions that preserve their forests while advancing economic development
  - PNG subscribes to principles of transparency, equitability, safeguards and professionalism
- PNG will **share lessons & experience** with other REDD+ countries through the **Coalition for Rainforest Nations**

Forests are an important part of PNG's heritage and culture ...

Primary rainforest of ~29 million ha covers more than 50% of PNG's land area

Environmental significance

- Islands comprise 3rd largest tropical rainforest area with rich wildlife and biodiversity, e.g. endemic marsupial mammal and flightless bird species

Economic importance

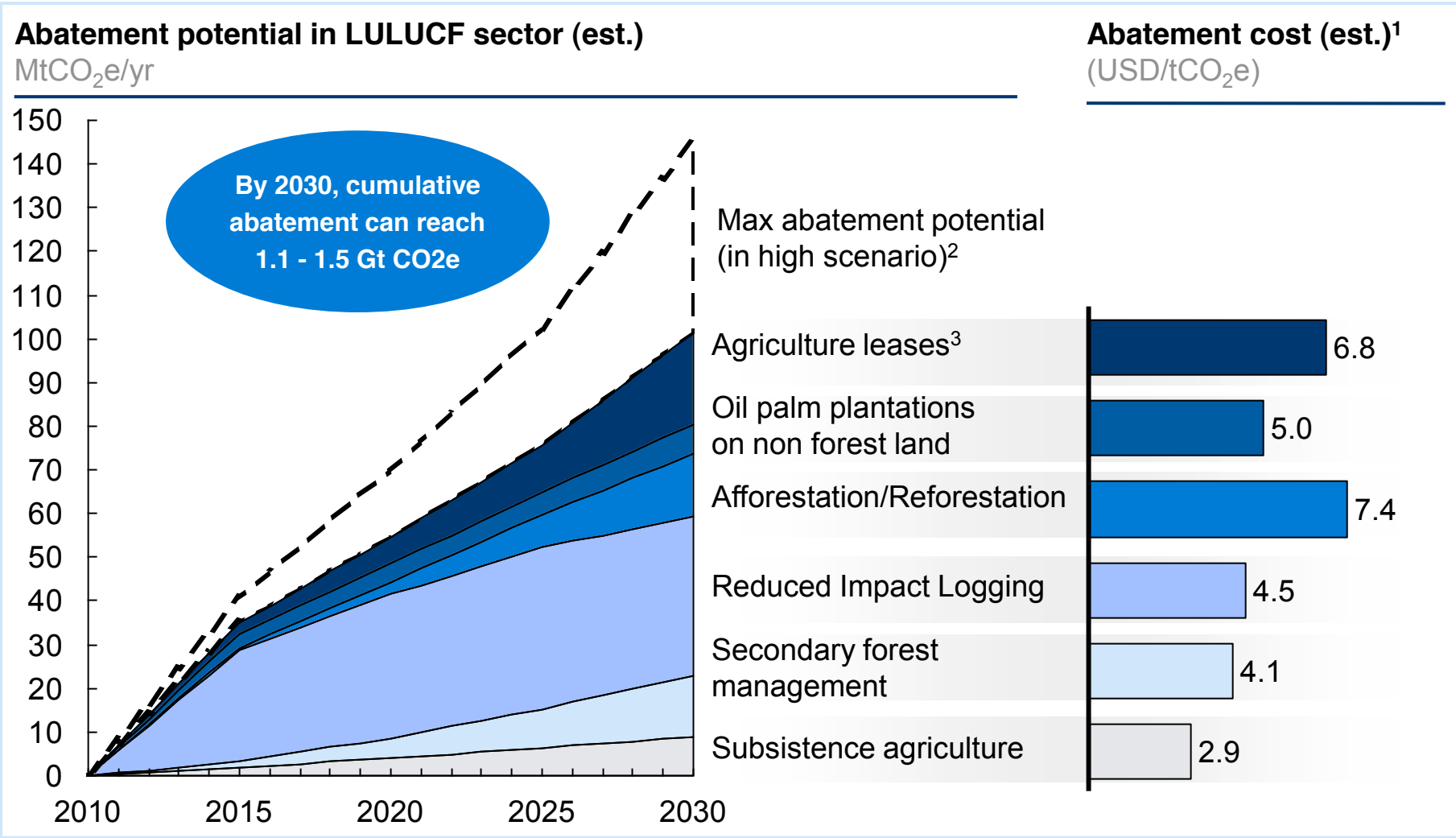
- Forestry contributes ~3-4% of GDP (down from 7.5% in 1990)
- Log export tax contributes ~ 4% of total tax revenue
- Timber industry provides jobs to ~ 9,000 people in rural areas

Social and cultural value

- ~ 80% of population is still dependent on local environment
- Each local community (more than 800 recognized language groups) has a unique relationship with the forest

SOURCE: PNG Climate-Compatible Development Plan

PNG has significant REDD+ abatement opportunities at reasonable cost …



1 Time adjusted cost of abatement based on program cost to implement abatement action
2 Additional abatement/sequestration potential from all levers in the high scenario, agricultural leases account for ~50% additional volume
3 Abatement cost does not include any compensation for the foregone profit from agricultural development

SOURCE: PNG Climate-Compatible Development Plan, REDD+ technical working group, OCCD analysis

Fast start actions have already been planned

	Implementation challenges	Proposed Fast Start Action
A Revoke agri-cultural leases causing deforestation	▪ Lease-leaseback scheme is contracted for 99 years ▪ Logging + agricultural use offers land-owners a highly attractive cash flow	**Review and revoke 2 agri-leases** ▪ Identify leases with questionable prospects ▪ Identify legal grounds to revoke leases ▪ Develop integrated land-use plan incl. REDD to offer land-owners a competitive land-use option
B Transition commercial agriculture to degraded lands	▪ Uncertainty of agricultural economics on degraded land ▪ Insufficient land mapping to match suitable land	**Identify and tender 2 oil palm plantations on degraded land** ▪ Conduct feasibility study in existing oil palm plantation in non-forest area (Ramu and Popondetta) ▪ Identify 2 commercial scale areas ▪ Tender to attract sustainable oil palm operators
C Promote affor-estation and reforestation	▪ Resources shortages (e.g., man power, funding) ▪ Long lead time of cash-flow for landowners compared to logging	**Identify/start 2 to 4 different afforestation projects** ▪ Identify areas in multiple provinces for different afforestation pilots (pulp, hard wood, conservation) ▪ Create integrated land-use plan and funding mechanism to bridge cash-flow gap for land-owners
D Enforce strict Reduced Impact Logging (RIL)	▪ Not yet proven in PNG ▪ Lack of enforcement capacity ▪ Strong opposition by logging industry	**Implement best in class RIL practice in 2 concessions** ▪ Identify 2 pilot sites in different provinces ▪ Build monitoring and enforcement capacity (incl. interim MRV) ▪ Gain insights into true economics of RIL in PNG

SOURCE: OCCD analysis

PNG will require ~USD 715-1,000 million until 2015

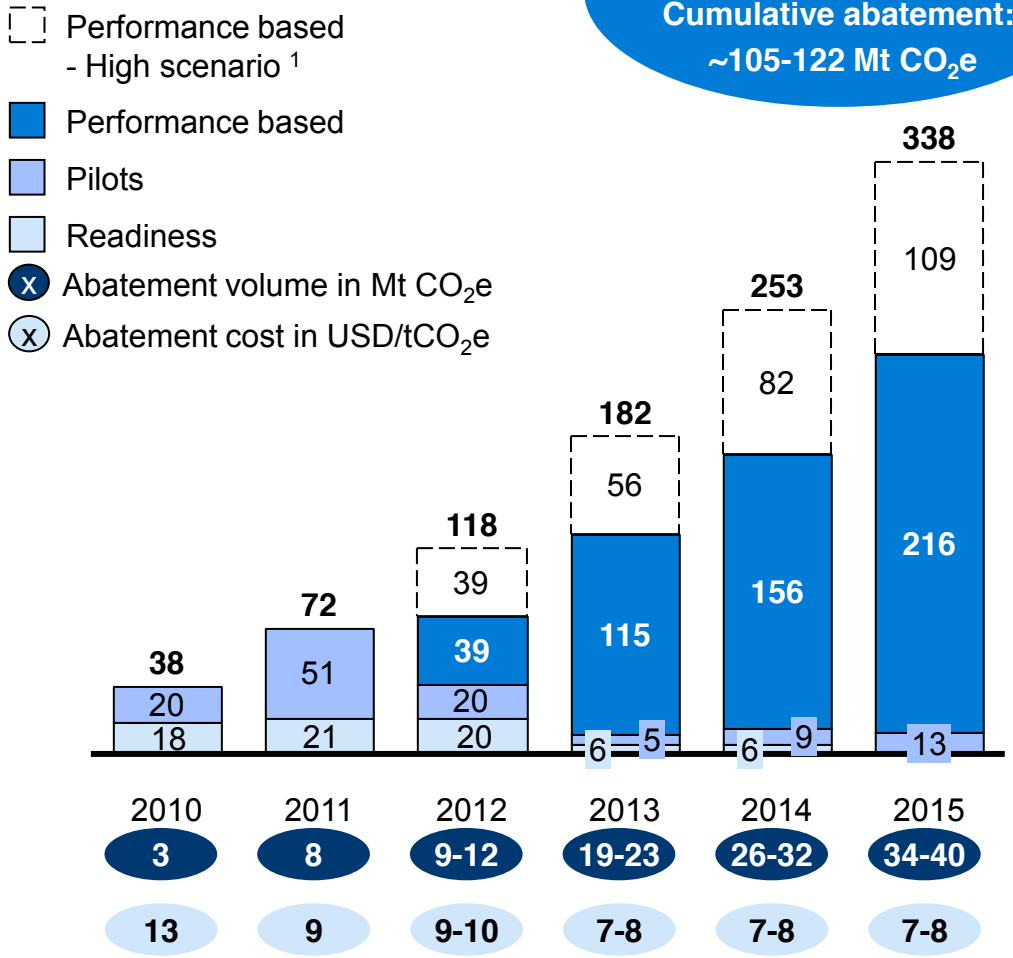
Readiness activities
- Establish REDD+ strategy
- Build / reform institutions, improve support services
- Carry out land tenure reforms, land use planning
- Set MRV system in place and payment processing system
- Stakeholder consultation

Pilots
- Reduced Impact Logging in ~30,000 ha
- Revoke 1-2 small agricultural leases (total ~15,000 ha)
- 2 feasibility studies of oil palm plantations on degraded land
- A/R in 45,000 ha by 2015
- Secondary forest management in 216,000 ha by 2015

Performance based
- RIL in all concessions (target: ~550,000-600,000 ha by 2015)
- Revoke ~50,000-115,000 ha of ag leases by 2015
- Push oil palm plantations to degraded land (~26,000-34,000 ha by 2015)

Total cost
USD millions

Cumulative cost: USD 715-1,000 million
Cumulative abatement: ~105-122 Mt CO_2e



1 Payment will be based on performance, using proxy MRV system

SOURCE: OCCD analysis

... with clear mitigation and adaptation priorities

Focus

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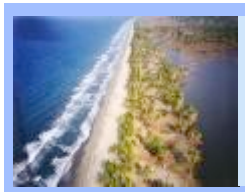

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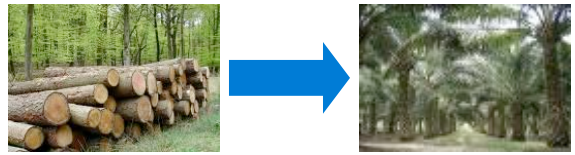

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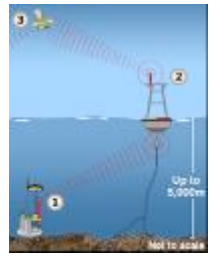
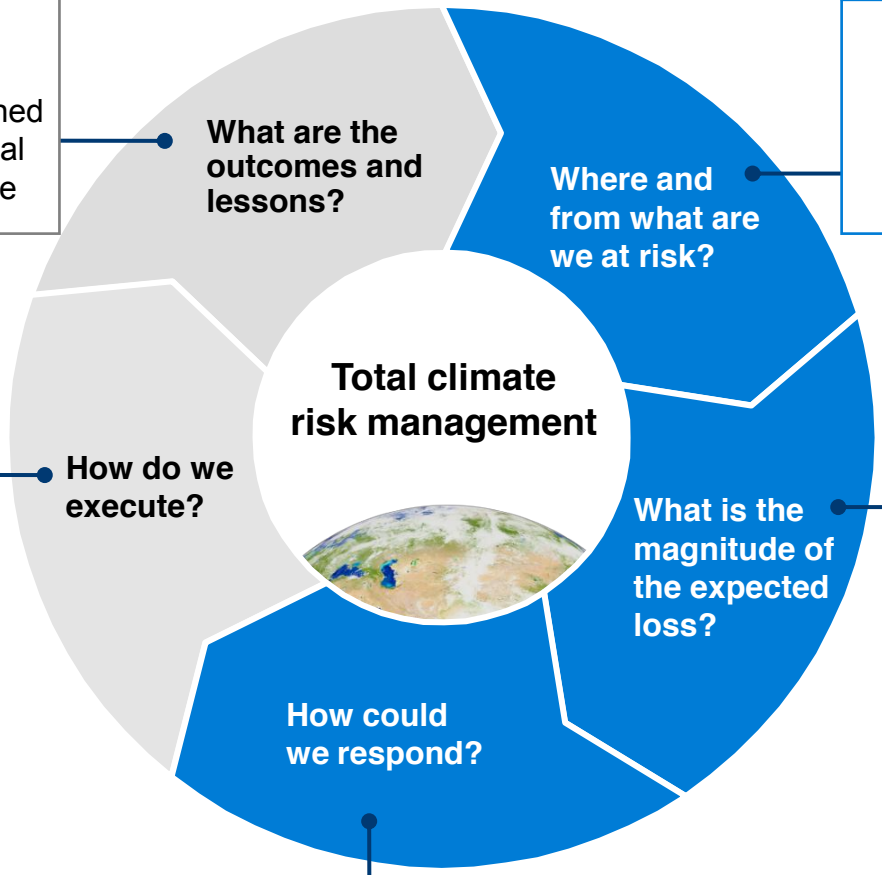


SOURCE: PNG Climate-Compatible Development Plan, OCCD analysis

Adaptation fact base included risk identification, loss assessment, and cost-benefit analysis

Focus of first phase



1
- Identify most relevant hazard(s)
- Identify areas most at risk
  - Population (especially vulnerable population)
  - Economic value (assets, GDP)

2

Hazard
- Assess frequency and severity per scenario

Value
- Quantify population, assets, and income value at risk

Vulnerability
- Determine vulnerability of population, assets and incomes

3
- Identify potential adaptation measures
- Determine basic feasibility of potential measures
- Determine societal costs and benefits (loss averted) of measures

4
- Identify key barriers to implementation
- Determine actions required to imple-ment measures

5
- Measure success based upon key performance metrics
- Incorporate lessons learned in next iteration of the total climate risk decision cycle

SOURCE: Economics of Climate Adaptation Working Group

Hazards which necessitate adaptive measures

USD millions

Hazard	Risk exposure
Coastal flooding	▪ Affects ~ 6,000; displaces ~ 400; and kills several people annually ▪ Damages buildings
Inland flooding	▪ Affects ~ 26,000; displaces ~ 8,000; and kills several people annually ▪ Damages buildings and property
Landslides	▪ Affects 500 - 600 and kills ~ 10 annually, mainly in remote, mountainous areas ▪ Damages infrastructure
Malaria	▪ Epidemics will affect ~ 200,000 more people in the highlands ▪ Highland cases are more severe
Agricultural yield loss	▪ 3 million people depend on climate-sensitive crops ▪ Climate change may reduce yields
Coral reef decay	▪ ~ 70,000 people earn a living from reefs ▪ Decay/bleaching may reduce this

Top-priority hazards to be addressed

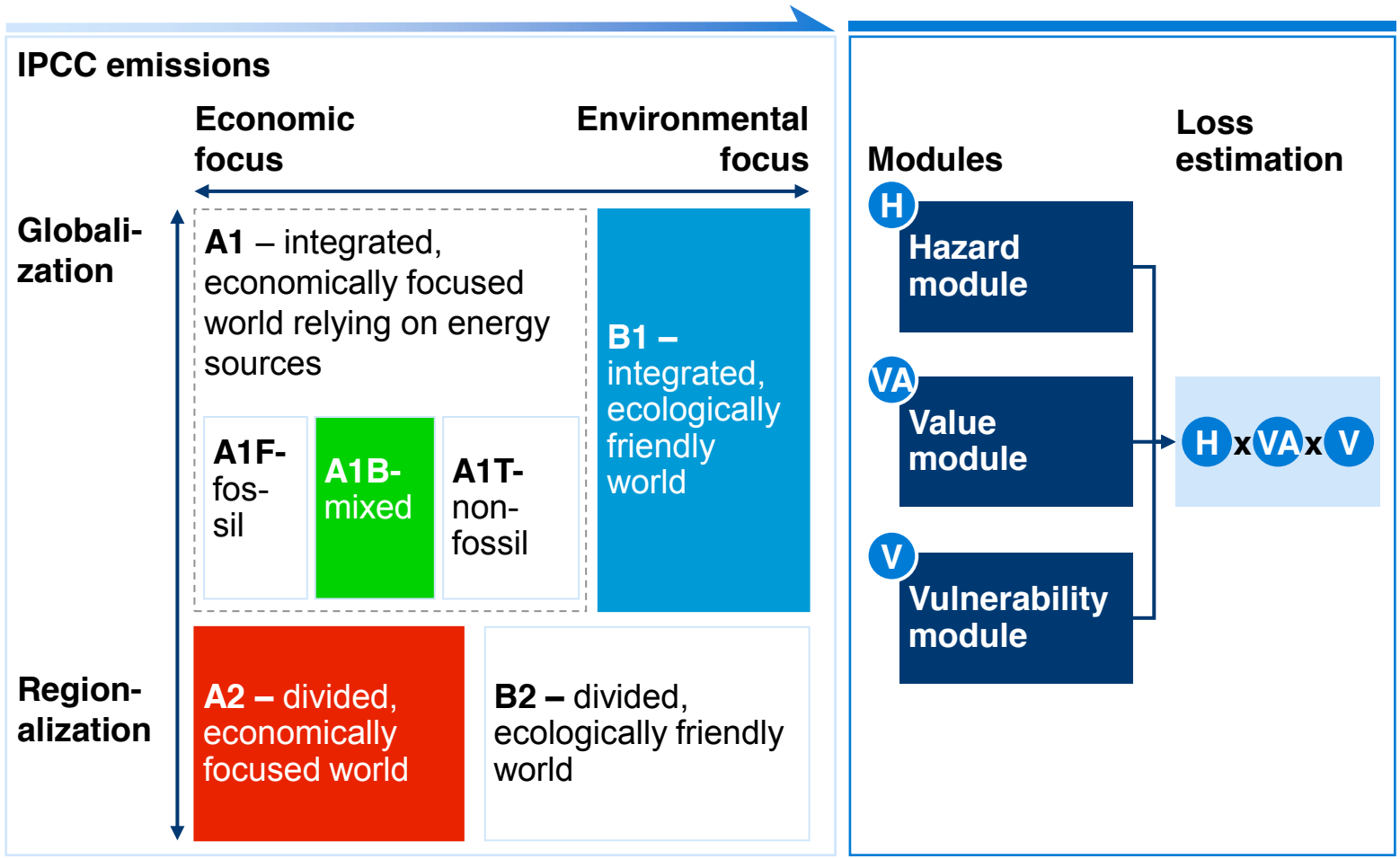
Already affects almost half the population, with climate change impacting ~ 200,000 more

PNG is vulnerable to coastal flooding, only to be exacer-bated by rising sea levels
- 20,000 km of coastline
- Severe floods affecting 6,000 + annually

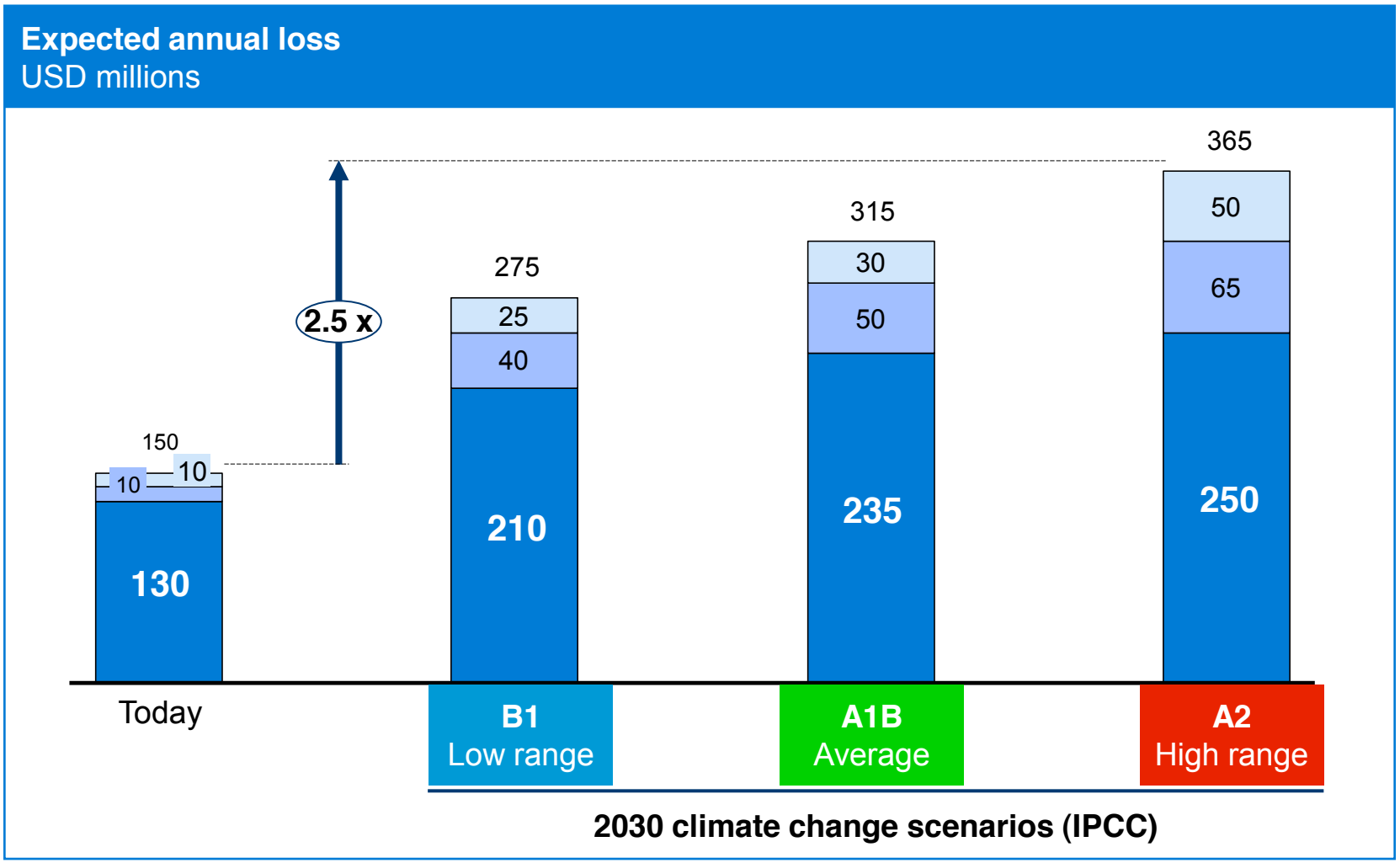
PNG suffers inland floods multiple times per year
- Extensive river system
- Population living close to rivers

SOURCE: Dartmouth Flooding Database; EM-DAT; Reliefweb.int; press clippings; academic journals; Reefbase; WHO; PNAS; Worldbank; FAO; IMF; WRI; TEEB; ANU; Internet research; interviews; adaptation technical working group

Future damage selected climate risks estimated for 3 IPCC scenarios

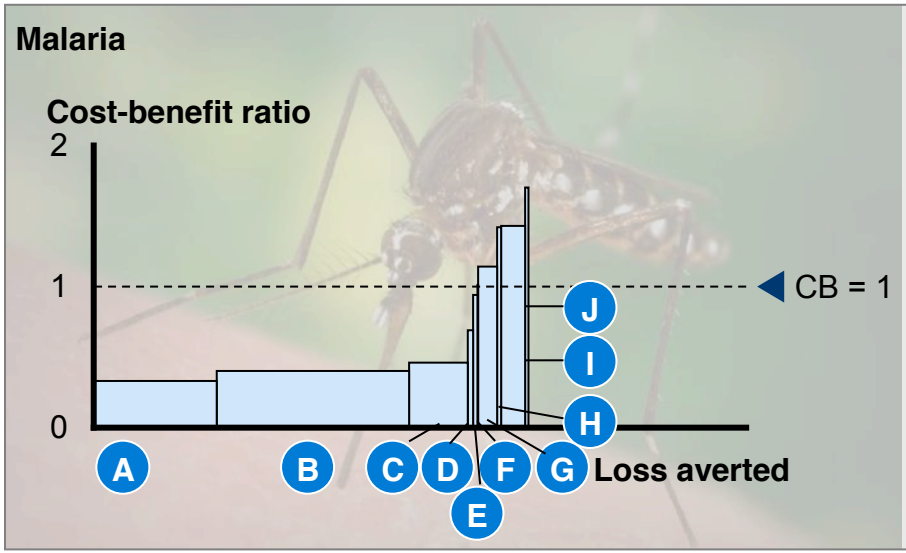


In the worst-case scenario, expected estimated loss from climatic hazards will increase from USD 150 to 365 million

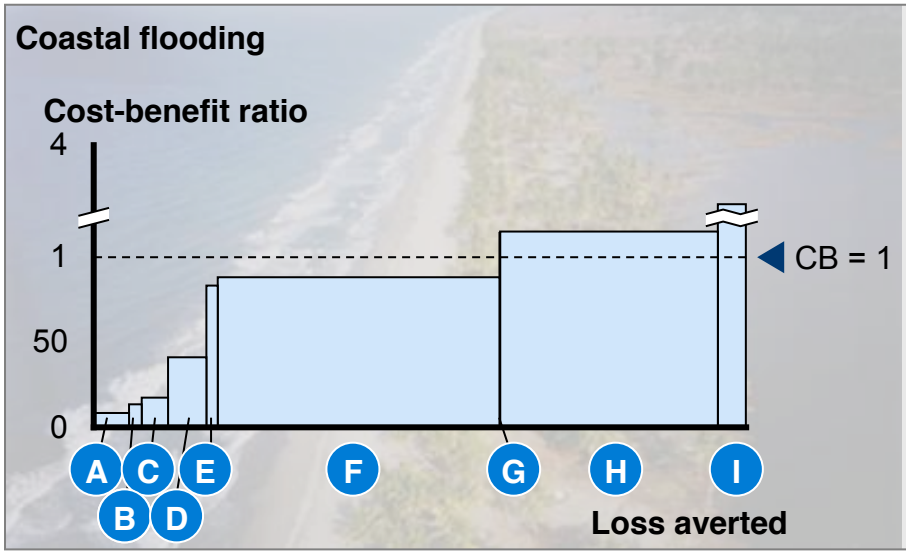


SOURCE: IPCC AR4; CSIRO; SEAFRAME; expert interviews; press clippings; academic literature; meteorological data; NASA SRTM; CGIAR; ESRI; PNG RIS; PNAS; WHO; CDC; World Bank; PNG MRI; WRI; Adaptation Technical Working Group

Cost curves developed for malaria and coastal flooding



- A Insecticide-treated bed net distribution (LLIN)
- B ACT as first-line treatment
- C Indoor residual spraying (IRS)
- D Malaria prevention for pregnant women
- E Introduce mosquito-larvae-eating fish
- F Build wells and reduce breeding grounds
- G Build more healthcare centers
- H Introduce bio-pesticides (plants)
- I Monitor mosquito resistance to treatment
- J Plant trees to provide shadow



- A Elevate new structures in flood zone
- B Revive reefs
- C Plant mangroves
- D Nourish beaches
- E Retrofit important buildings
- F Build retaining wall in high-value locations
- G Flood-adapt house contents
- H Build dikes
- I Create offshore breakers

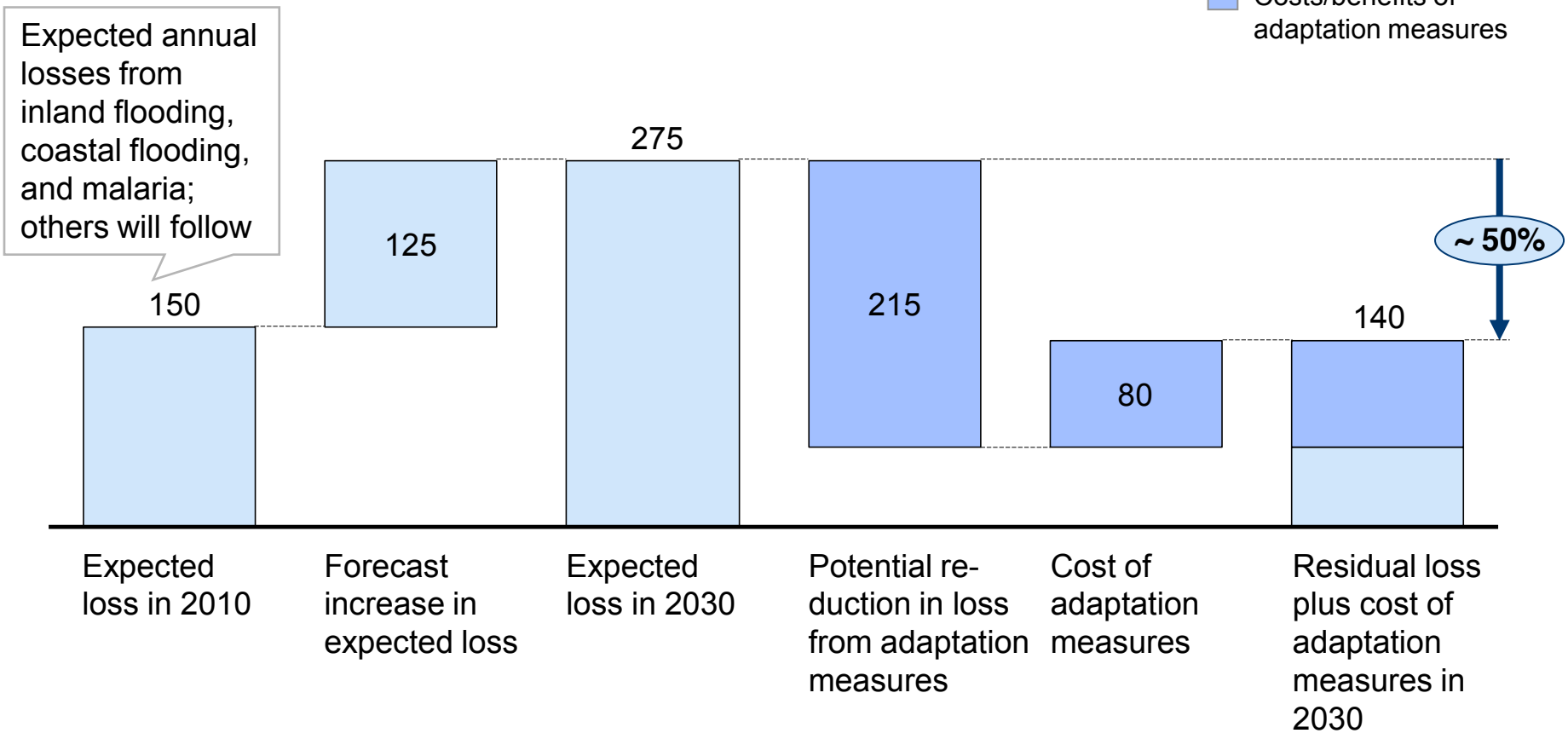
SOURCE: Press clippings; UNESCO; WHO; NAPAs; academic journals; press clippings; CDC; PNG High Commission; Delta Committee reports; SFWM System; US Army Corps; team analysis

Losses are forecast to double by 2030, but timely investment in adaptation measures could reduce losses to current level

BEST-CASE[3] EXAMPLE | MALARIA, COASTAL AND INLAND FLOODING

Expected losses from climate-related hazards and adaptation measures

USD millions at constant prices

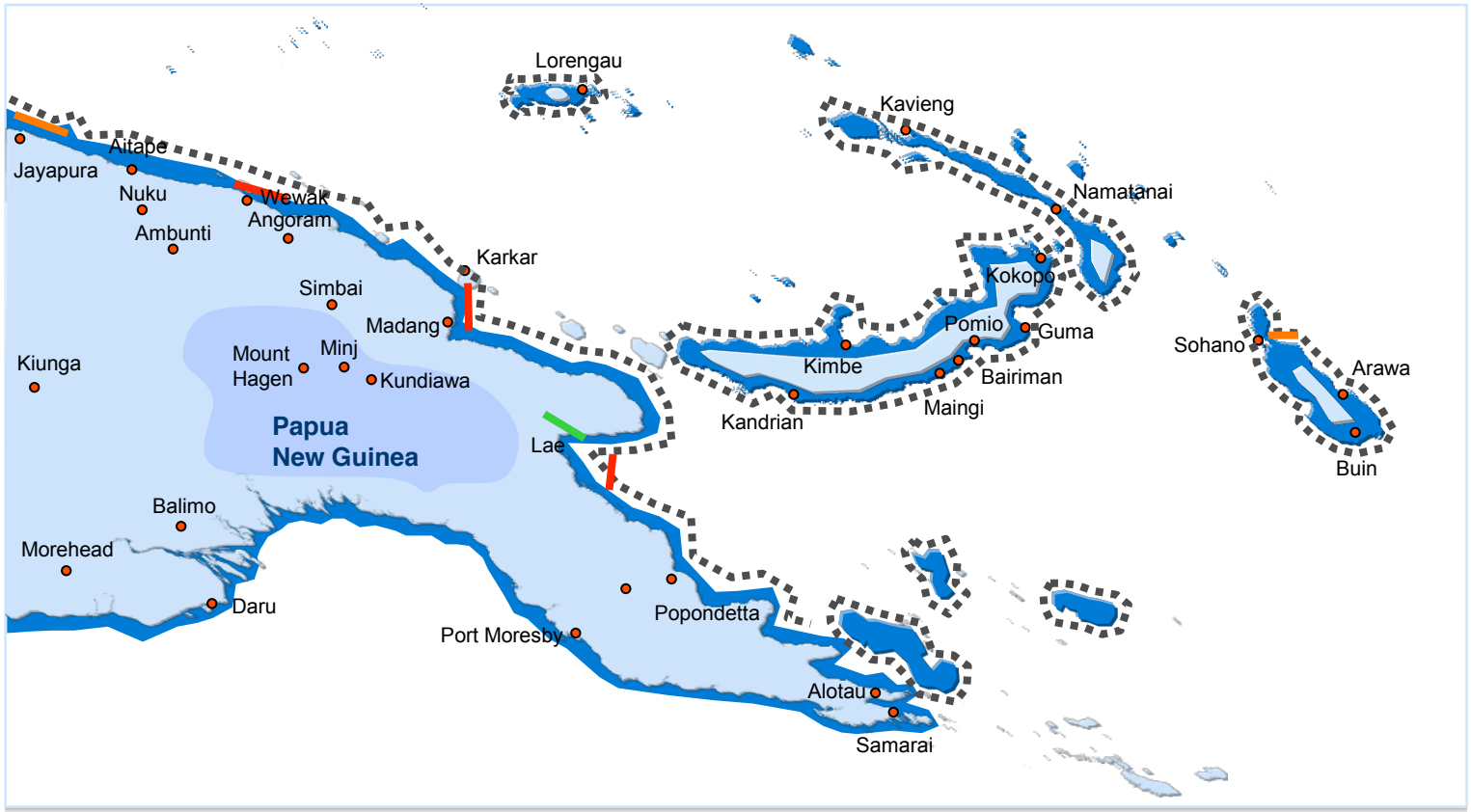


1 Loss averted through cost-effective measures (inland flooding: 90%, coastal flooding: 70%, malaria: 80%,
2 Average cost benefit of cost-effective measures assumed (inland flooding: 45%, coastal flooding: 45%, malaria: 30%)
3 Low-range expected loss, high-range cost-effective measures, and low-range cost-benefit ratio

SOURCE: Adaptation Technical Working Group

Priority adaptation measures to be implemented across PNG

ILLUSTRATIVE



Not shown

- Prevention in remote (high-land) villages
- Prevention in workers' camps

- Retaining wall in 1st priority cities
- Retaining wall in 2nd priority cities
- Community-based mangrove planting
- Early warning system

- Lae flood protection
- Early warning system

SOURCE: Adaptation Technical Working Group

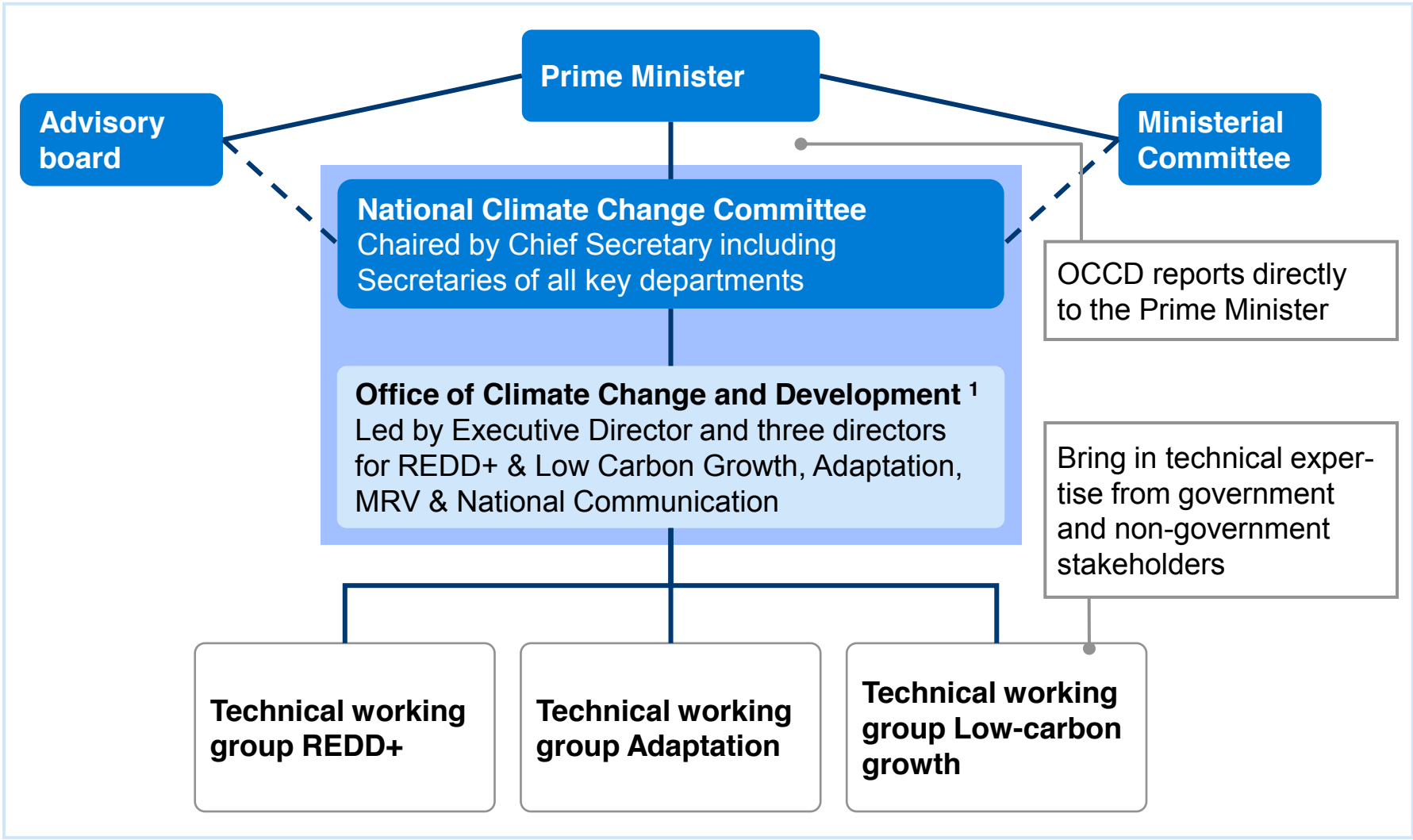
Adaptation initiatives – coastal flooding example

	Objective	Responsible institution	Proposed location	Proposed budget	Timing and next steps
Mangrove protection	▪ Involve coastal communities in planting and maintaining mangroves	▪ MRIC/UPNG ▪ DEC ▪ TNC ▪ WWF ▪ WCS	▪ North/Islands – Finschafen – Morobe – Madang – New Ireland – Manus	▪ 2010: USD 0.6 m ▪ 2011: USD 0.8 m ▪ 2012: USD 1.0 m ▪ 2013: USD 1.3 m ▪ 2014: USD 1.5 m	▪ Consultation with villages ▪ Hire/train field staff
Seawall protection	▪ Build seawalls around top-5 high-risk cities	▪ DoW (national and provincial) ▪ Town authorities ▪ SMEC	1. Wewak 2. Lae 3. Madang 4. Buka 5. Vanimo	▪ 2010: USD 8 m ▪ 2011: USD 8 m ▪ 2012: USD 8 m	▪ Contact provincial works manager/city manager
Early warning system	▪ Set up coastal flooding warning system and expand monitoring	▪ NWS ▪ NDC ▪ SEAFRAME ▪ Dept. of Minerals and GeoHazards ▪ Provincial authorities ▪ Media ▪ Private sector	▪ Bismarck Sea	▪ 2010: USD 0.5 m ▪ 2011: USD 0.6 m ▪ 2012: USD 0.1 m ▪ 2013: USD 0.1 m ▪ 2014: USD 0.1 m	▪ Set up NWS, NDC, private partnerships

SOURCE: Adaptation Technical Working Group; team analysis

Cabinet has approved the institutional framework to ensure implementation

OCCD



1 OCCD Executive Director reporting directly to Prime Minister

SOURCE: NEC decision 54/2010, OCCD analysis

Roadmap and milestones to COP16 and beyond