



The costs of stopping deforestation

RMAP/ Crawford School
ANU

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Deforestation

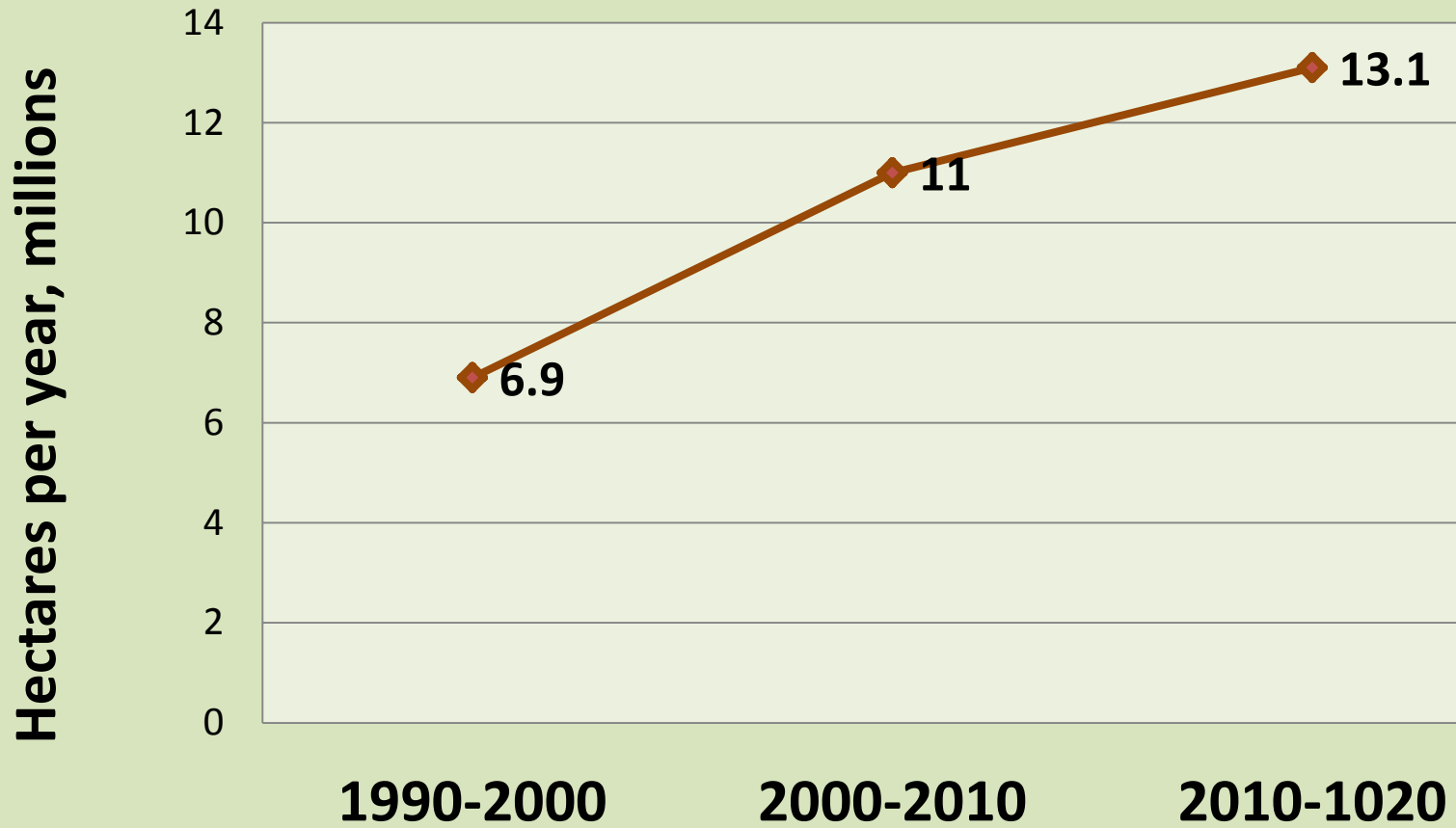
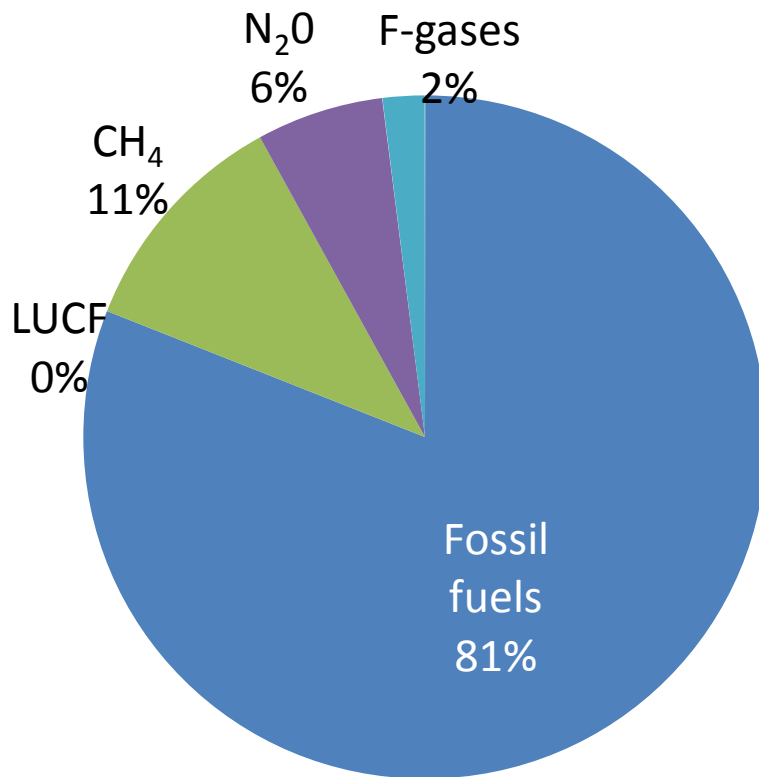


Figure 1

Sources of greenhouse gases - countries

A. Developed



B. Least developed^a

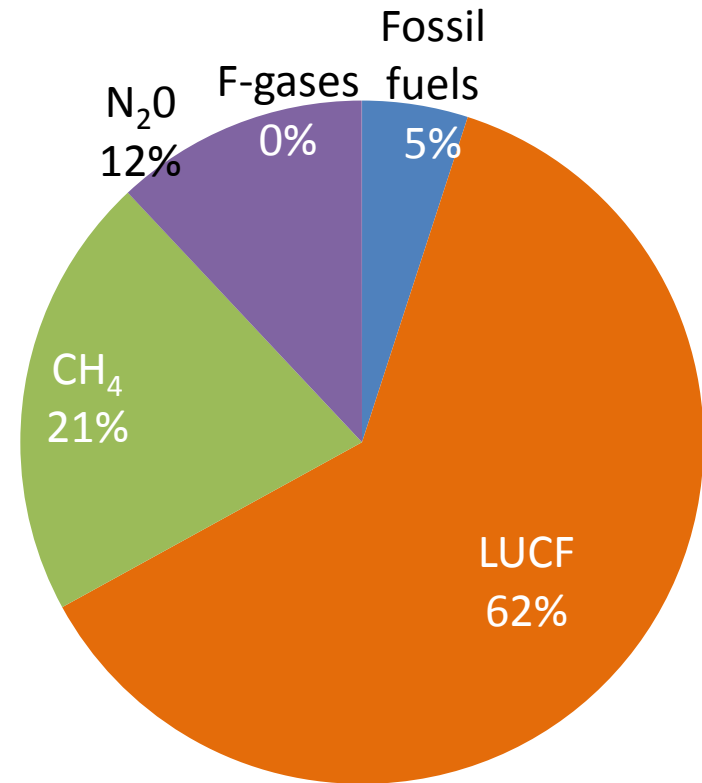
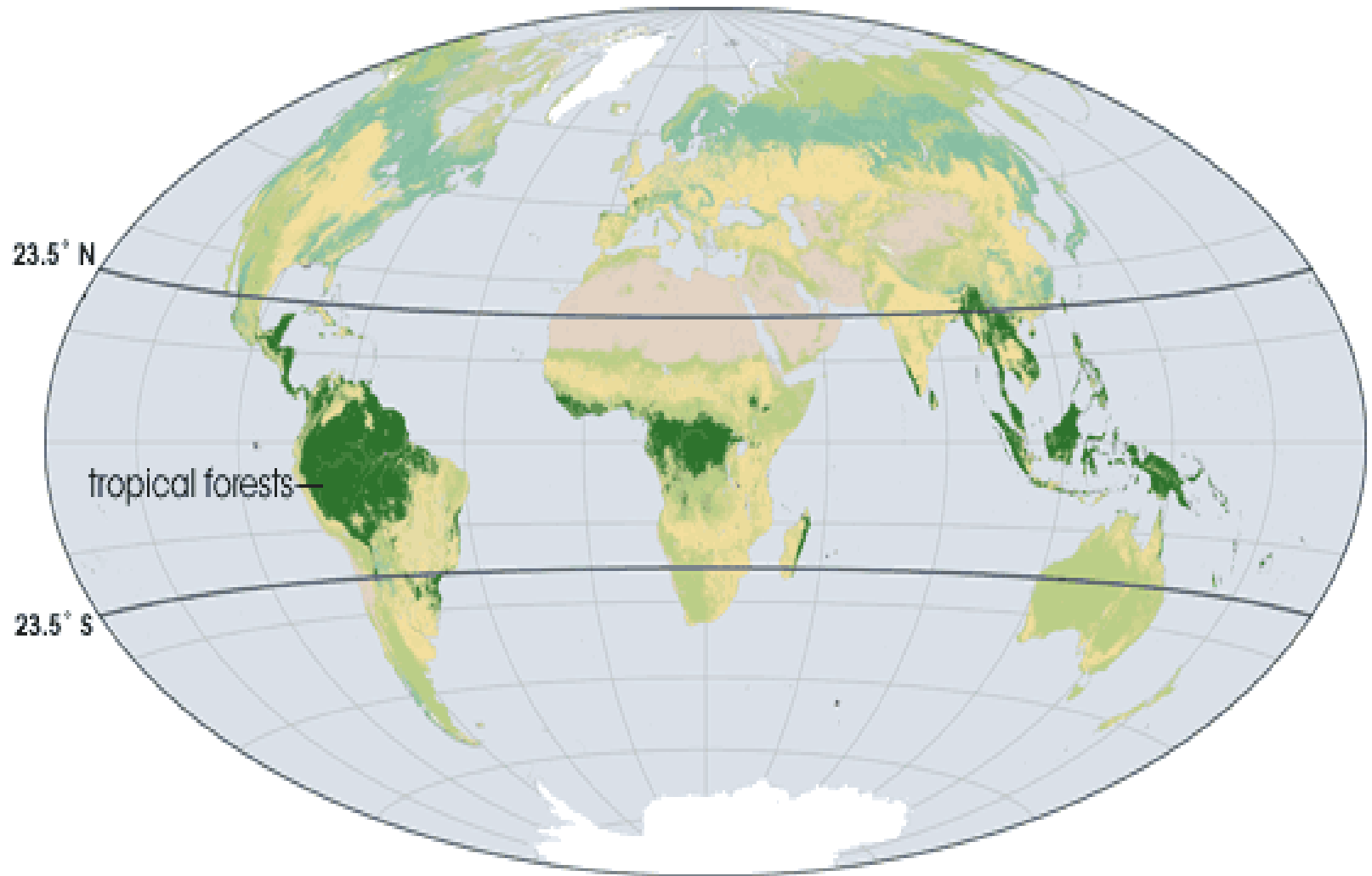


Figure 2

The world's tropical forests



Sources of carbon emissions - regional

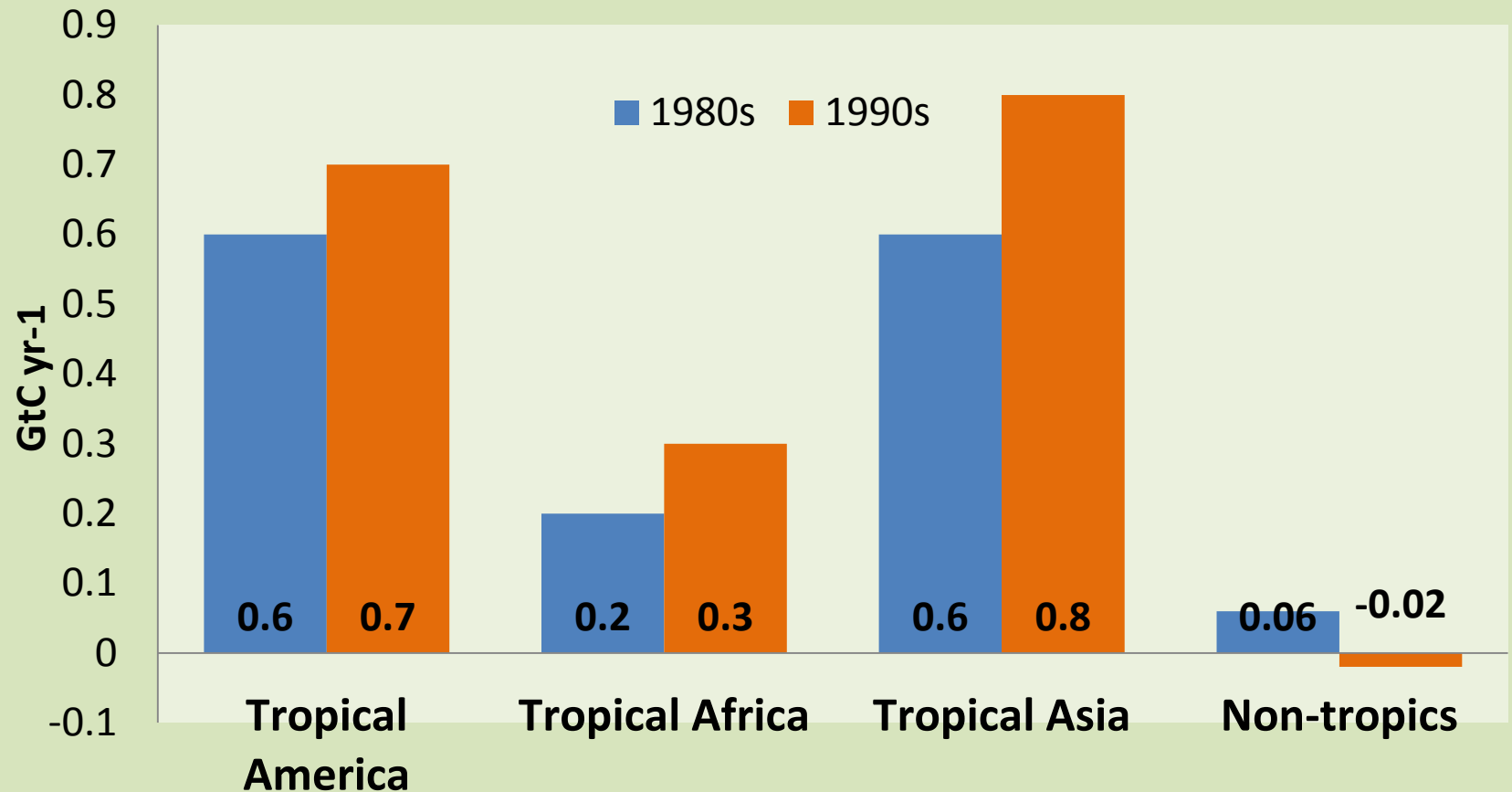


Figure 3



Proportion of global greenhouse gas emissions from LUCF, %

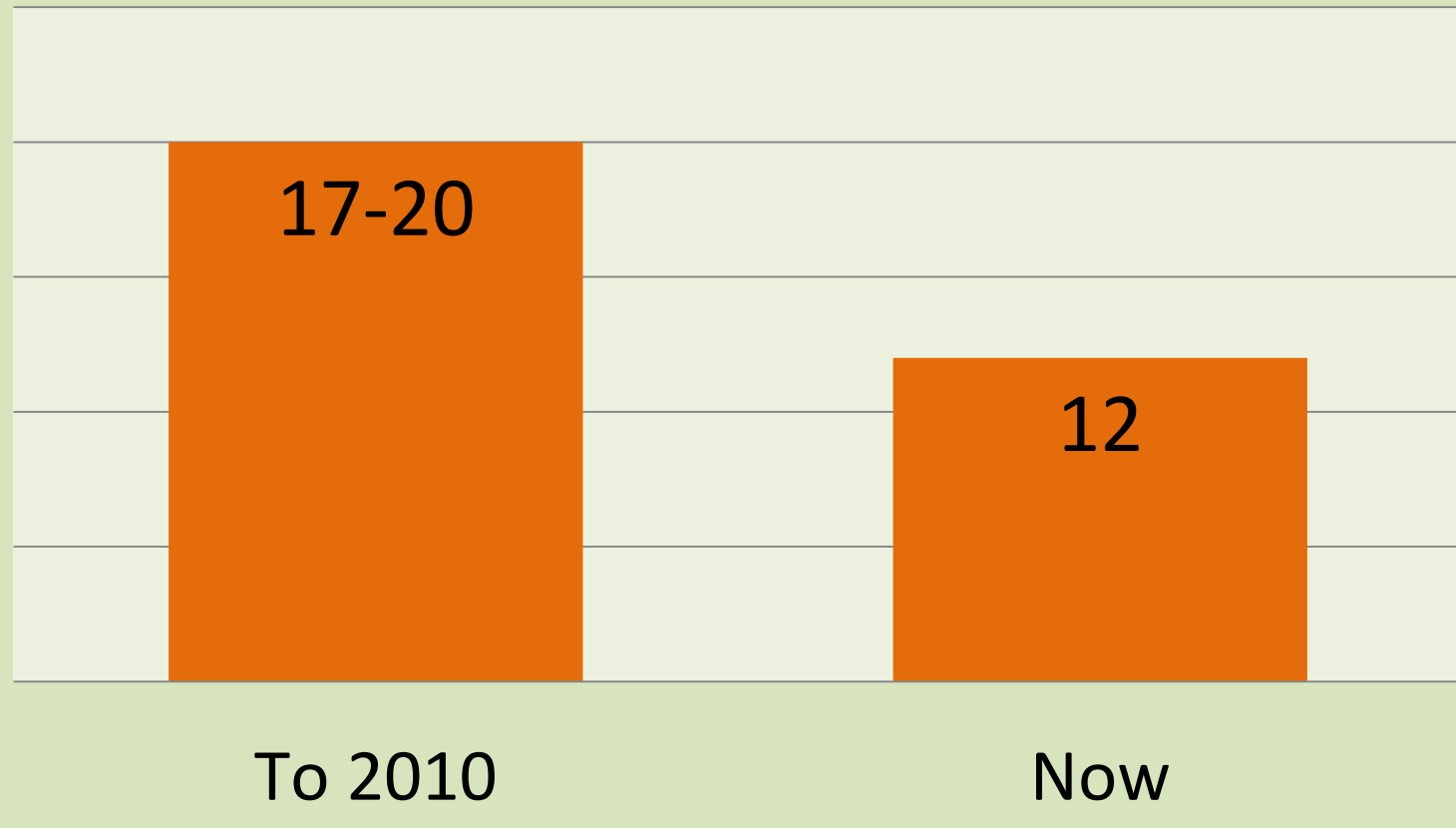


Figure 4



Pledged for REDD - Copenhagen Accord

- USD30 billion for 2010-2012, rising to USD100 billion a year by 2020 (UNFCCC 2009; Clause 8).
- Australia, United States, France, Japan, Norway and Britain pledged USD 3.5 billion to support immediate steps to implement the Accord (Reuters 2009).



Why this level of commitment?

- “Reducing deforestation offers a major opportunity to reduce emissions at relatively low cost” (Stern 2006: 610).
- “REDD is clearly an inexpensive approach compared with emissions reductions in the energy sectors of industrialized countries” Boucher (2008:1).

Research question

What are the costs of REDD?

Opportunity costs of REDD

$$\$BAU \quad - \quad \$\text{with REDD} \quad = \quad \$\text{opp. cost}$$

BAU = business as usual

REDD = Reduction in deforestation and forest degradation

Opportunity costs of REDD

$$\frac{\$ \text{ opp cost}}{T \text{ CO}_2 \text{ avoided}} =$$

\$ opp cost / T CO₂ avoided

Methodology

$$\frac{\text{Opportunity cost}}{\text{Tonnes CO}_2 \text{ emissions avoided}}$$

First examine denominator



Changing estimates CO₂^{yr-1}, LUC

PNG

Mt

- WRI (2009) 146
- WRI (2010) 44
- Busch (2090) 104
- Fox et al. (2009) 40

Indonesia

Mt

- WRI (2009) 2563
- WRI (2010) 1462

Methodology

Second examine denominator



Opportunity cost

Tonnes CO₂ emissions avoided

Opportunity costs (1)

Oslen & Bishop(2008) →

net income per hectare

Venter et al. (2009)

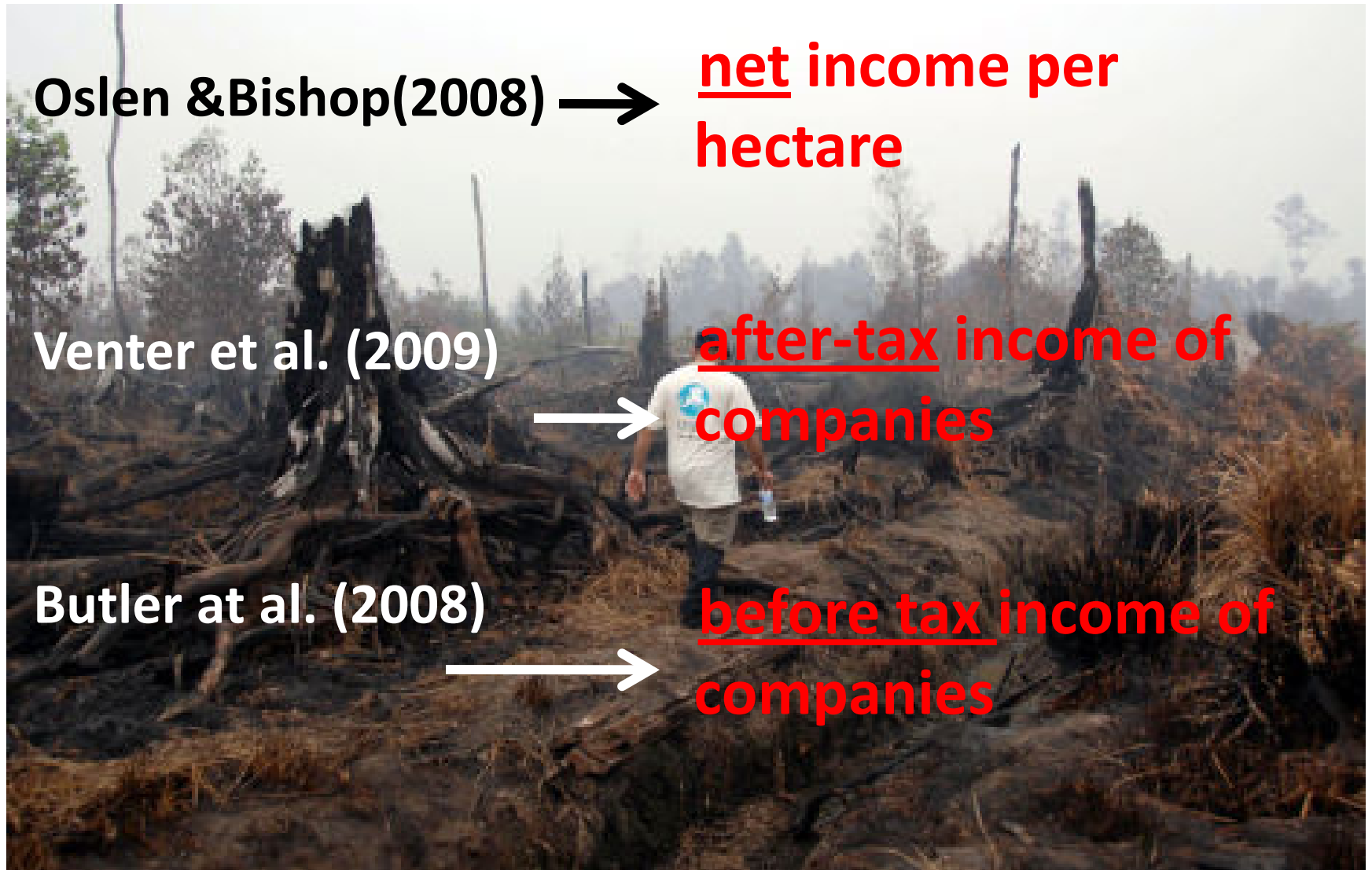



after-tax income of companies

Butler at al. (2008)



before tax income of companies





Cost results - other studies

Overall LUC

P.V.\$/TCO₂

Busch (2009)

2.24

Boucher (Asia) (2008)

2.90

Palm oil

P.V.\$/TCO₂

Olsen and Bishop (2008)

3-7

Venter (2009)

10-33

Butler (2009)

12-29



Opportunity costs (2)

Financial incentive would offset lost agricultural income to producers, “...**although it would not reflect the full value chain within the country**” (Stern 2006: 610).

Backward linkages



Opportunity costs (3)

Stakeholder income foregone

- Company
- Government
- Landowner/Smallholder

National income foregone

- Export income
- National income

Opportunity costs - stopping PNG logging in 2012

PV/T CO₂ avoided \$US

Net income loggers

1.15

Government revenue

1.30

Landowners

1.29

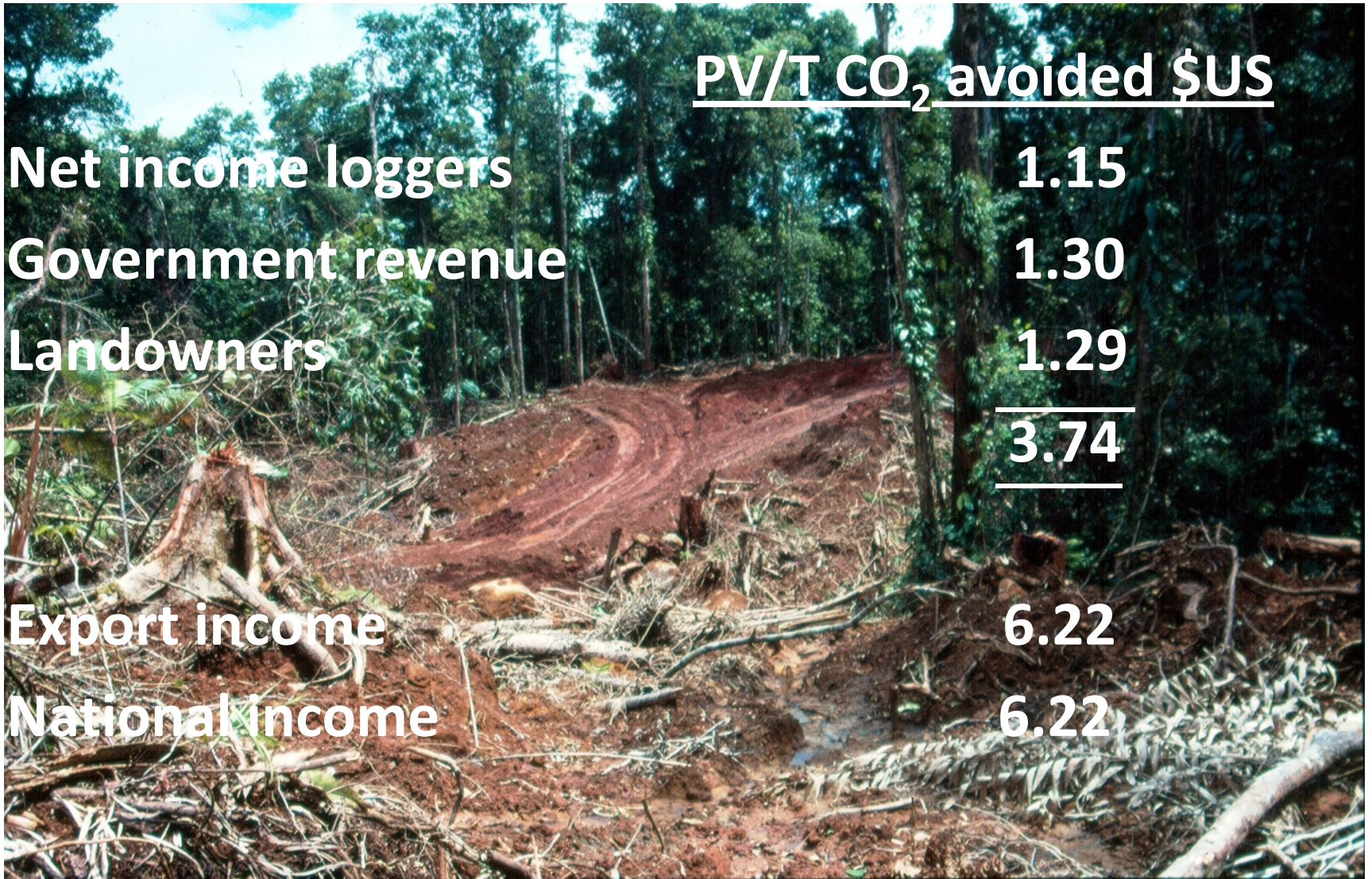
3.74

Export income

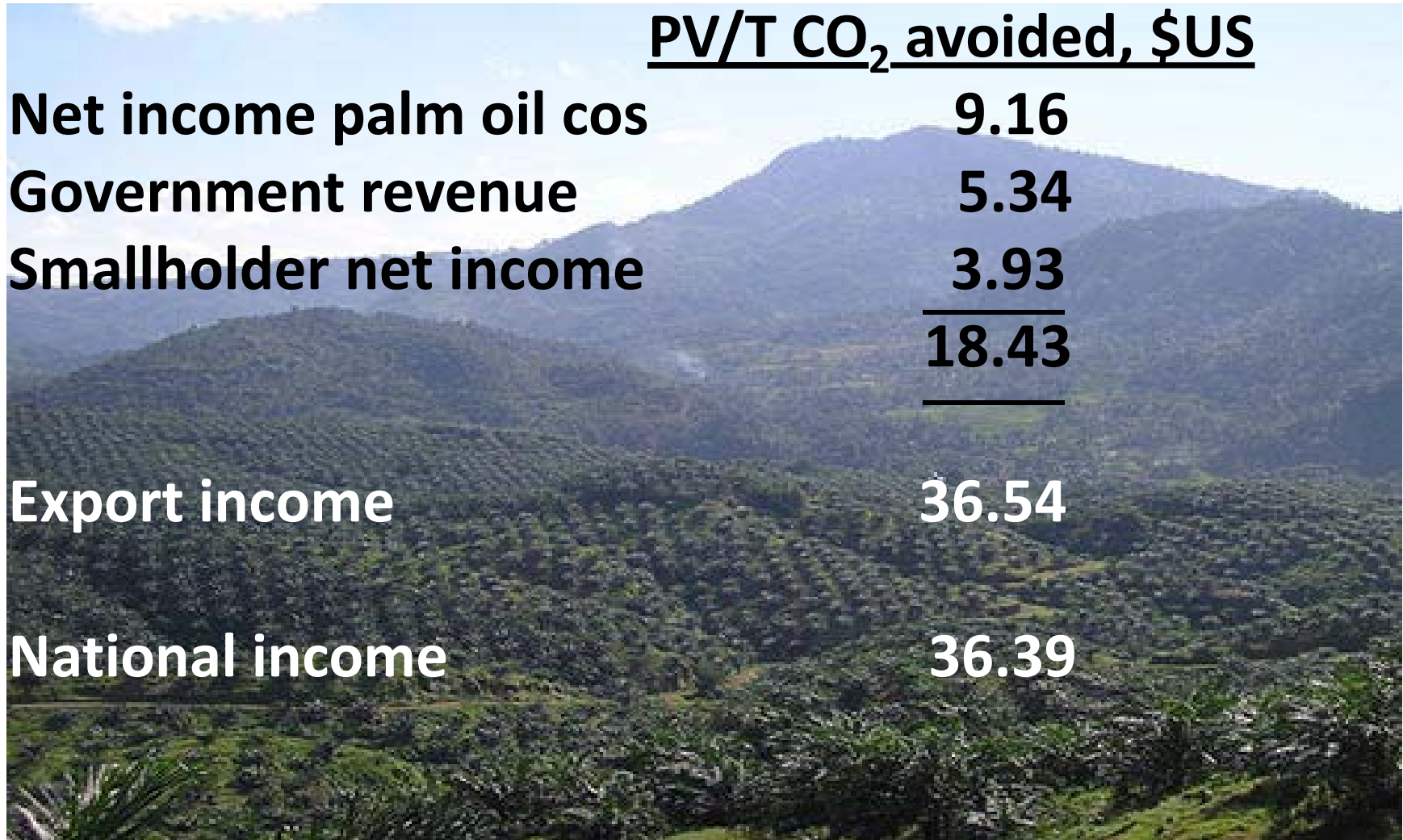
6.22

National income

6.22



Opportunity costs - stopping new PNG palm oil in 2012



| | <u>PV/T CO₂ avoided, \$US</u> |
|-------------------------|--|
| Net income palm oil cos | 9.16 |
| Government revenue | 5.34 |
| Smallholder net income | 3.93 |
| | <hr/> |
| | 18.43 |
| | <hr/> |
| Export income | 36.54 |
| National income | 36.39 |



Likelihood of investment shifting offshore

- Logging companies High
- Palm oil companies High

Socio-economic implications(1)

Reduced regional opportunities for income generation and employment



Socio-economic implications(2)



**Encouragement
of drift to
urban centers**

Socio-economic implications(2)

Employment and smallholder income foregone with cessation in conversion to oil palm in 2012

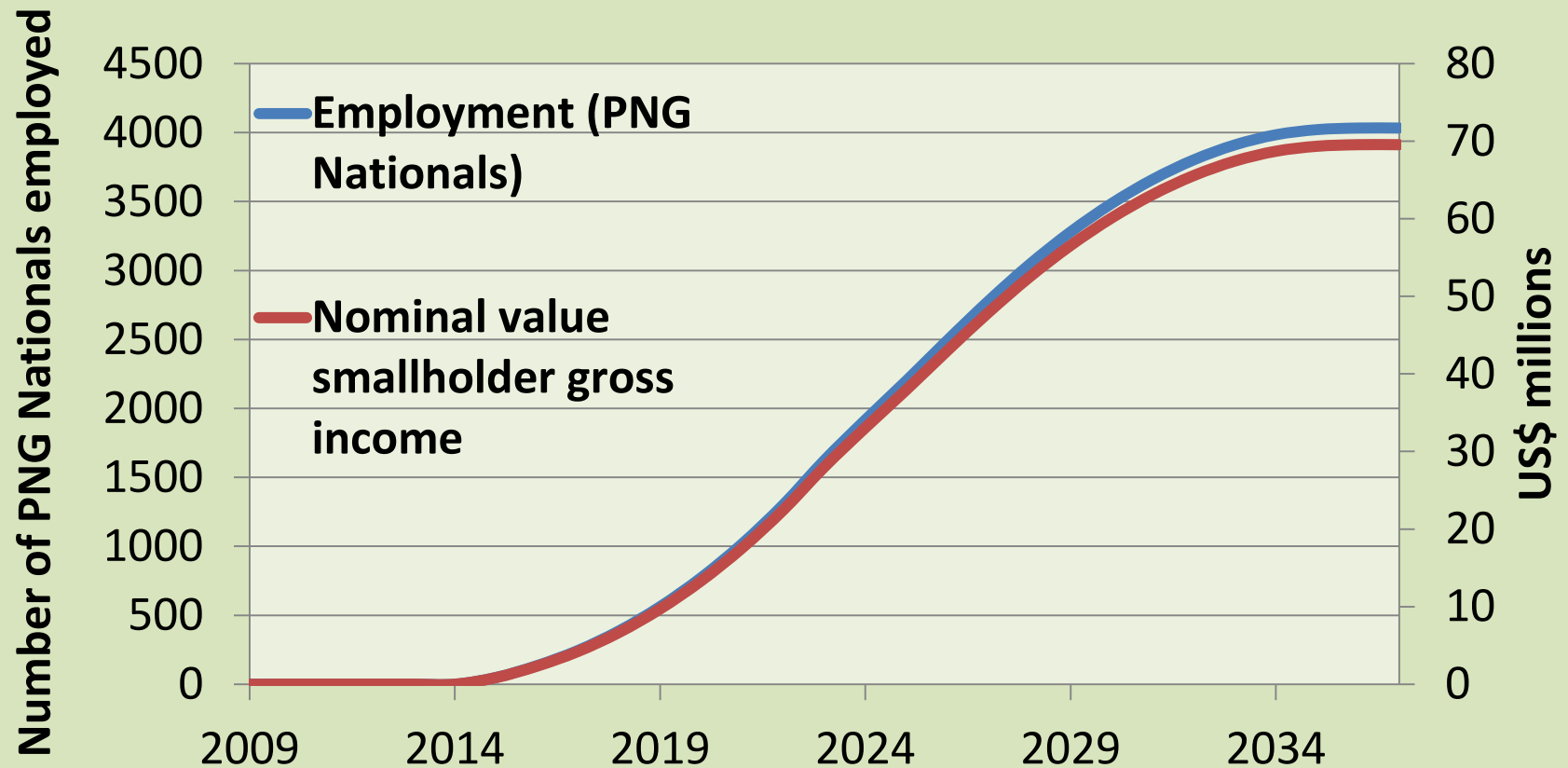


Figure 5

Socio-economic implications(3)

Subsistence agriculture is a source of CO₂ emissions





Socio-economic implications(4)

Opportunity cost of subsistence agriculture

is low:

NPV/T CO₂ avoided, \$US

| | |
|----------------------------|--------|
| Olsen and Bishop (2008: 5) | 0-1.53 |
|----------------------------|--------|

| | |
|-----------------|------|
| McKinsey (2009) | 2.00 |
|-----------------|------|



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Socio-economic implications(5)



The implication is that subsistence farmers would be relocated to a town and issued with vouchers to buy their provisions from a supermarket!



Summary

Research question



**Costs of stopping
deforestation**

Methodology



**PNG: Cost/T CO₂
(financial plus emissions
modeling)**

Results



**Revealed: Costs to
stakeholders and to
nation**

Compensation policy for REDD

How much?

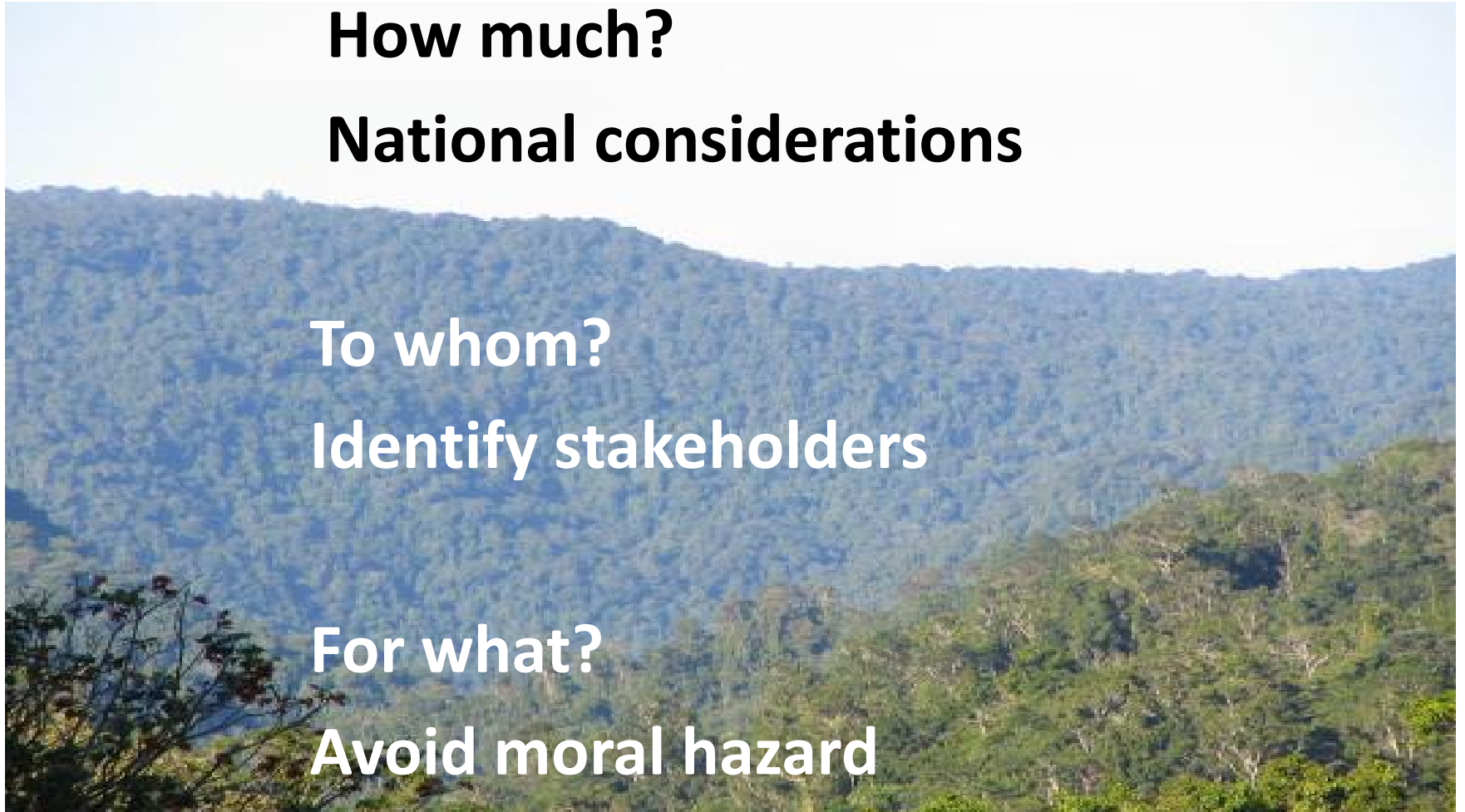
National considerations

To whom?

Identify stakeholders

For what?

Avoid moral hazard



Next 4 slides:

Modelling of PNG logging and
palm oil industries.

CO₂ emissions from logging, actual to 2008, medium BAU projected to 2025 and abated from 2012

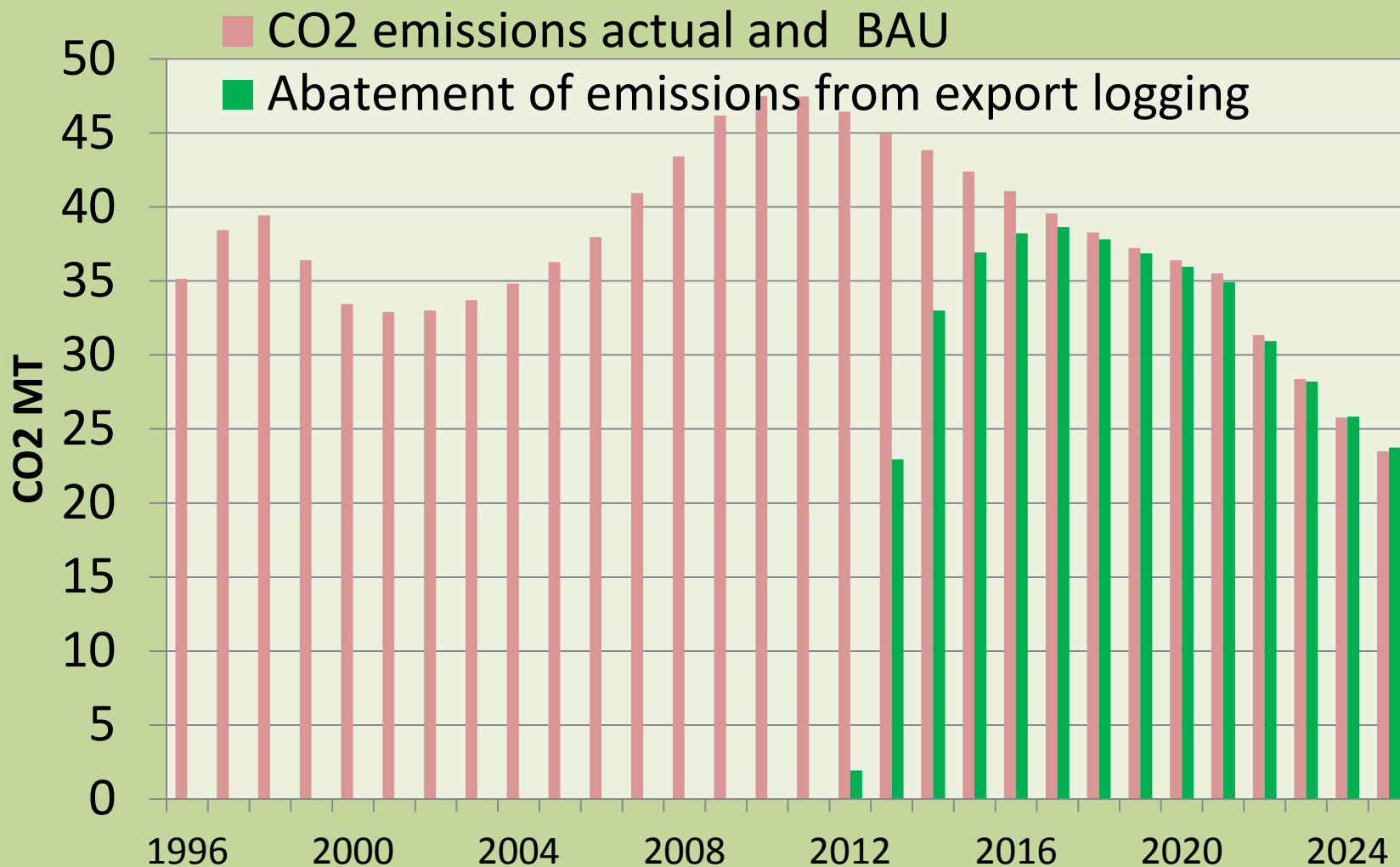


Figure 6

Income from raw log exports and domestic processing, actual to 2008, medium BAU projected to 2025

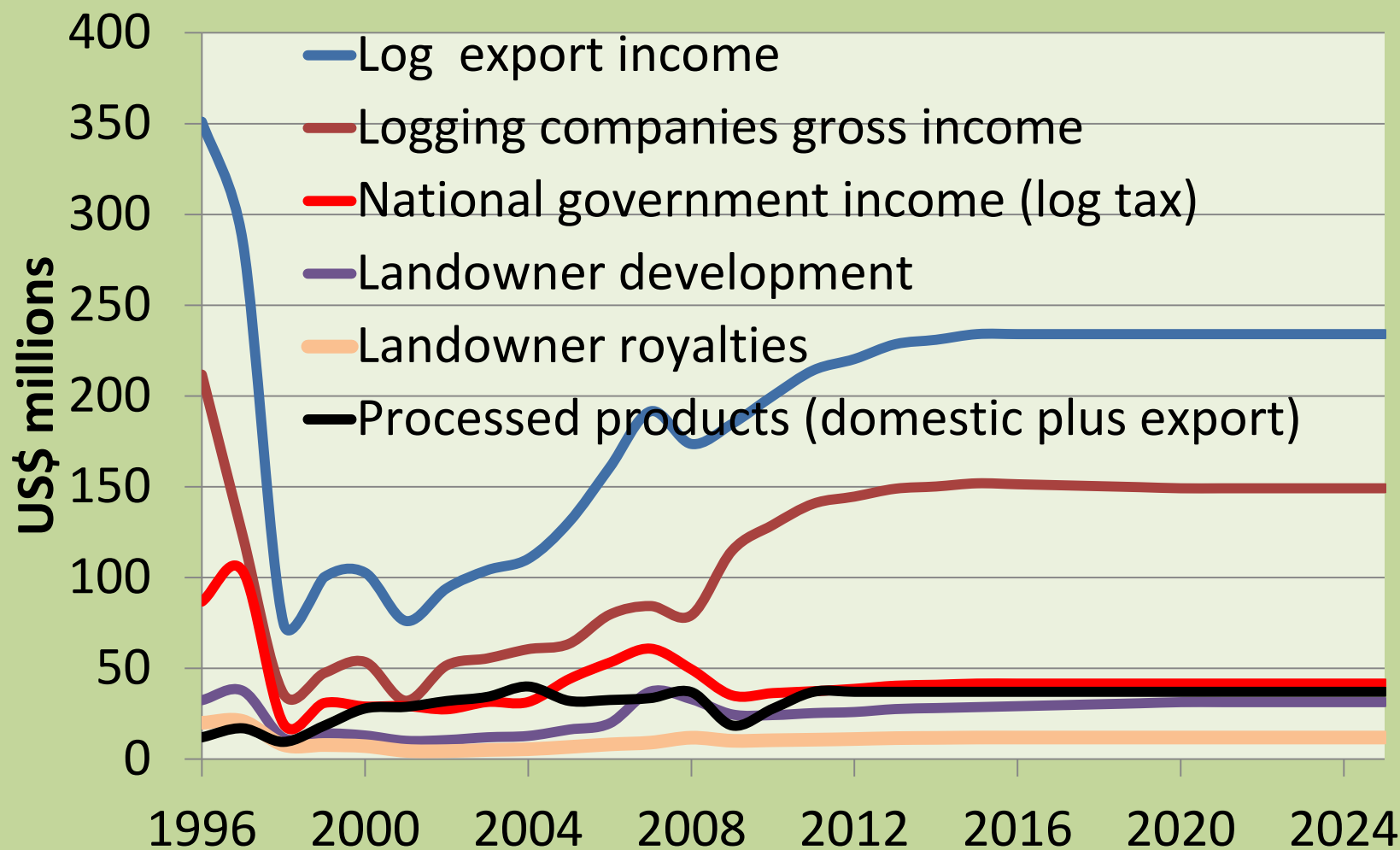


Figure 7

CO₂ emissions from oil palm, actual to 2008, medium BAU projected to 2037 and abated from 2012

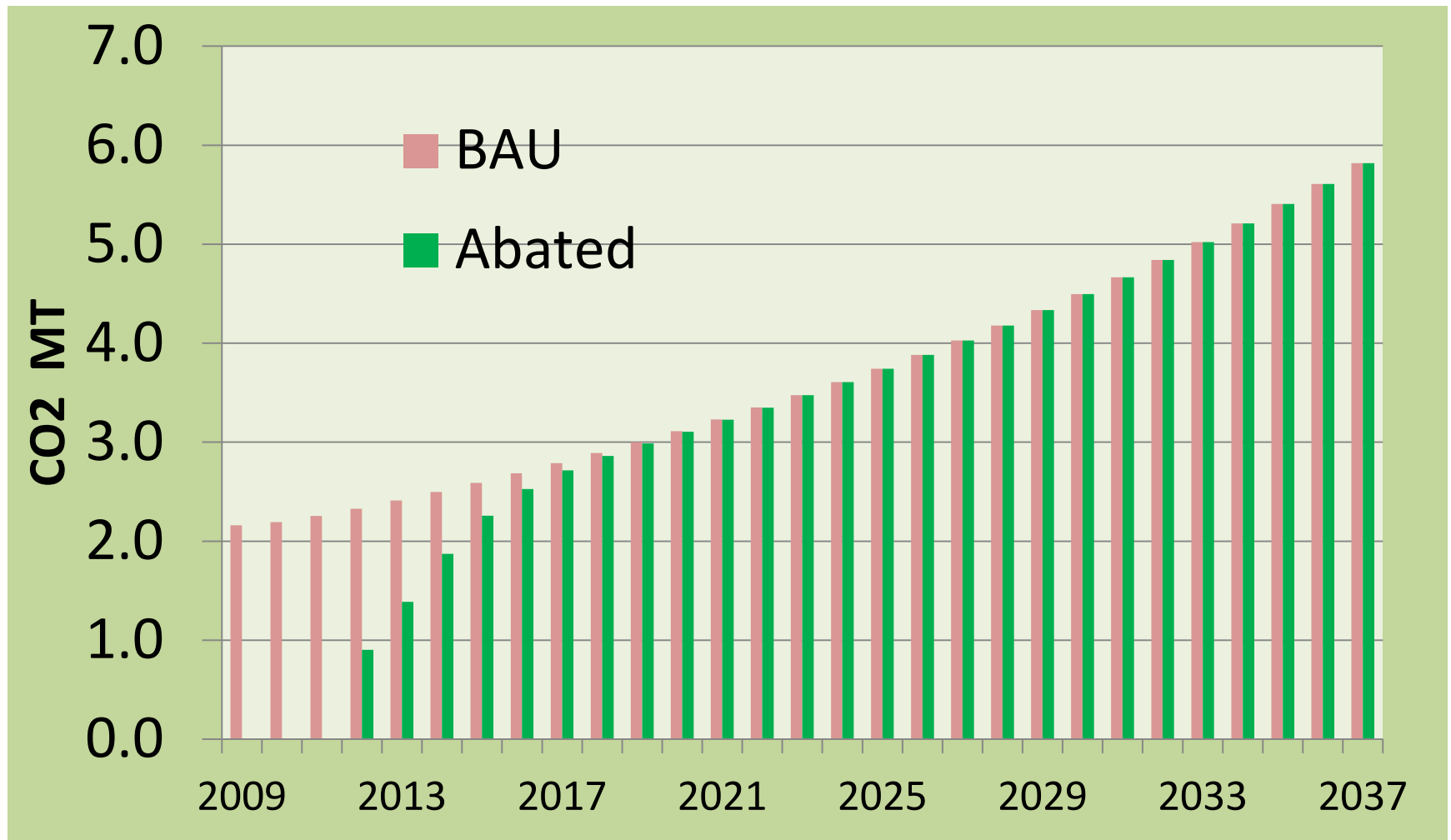


Figure 8

Opportunity costs of cessation in expansion of oil palm 2012-2037, nominal values

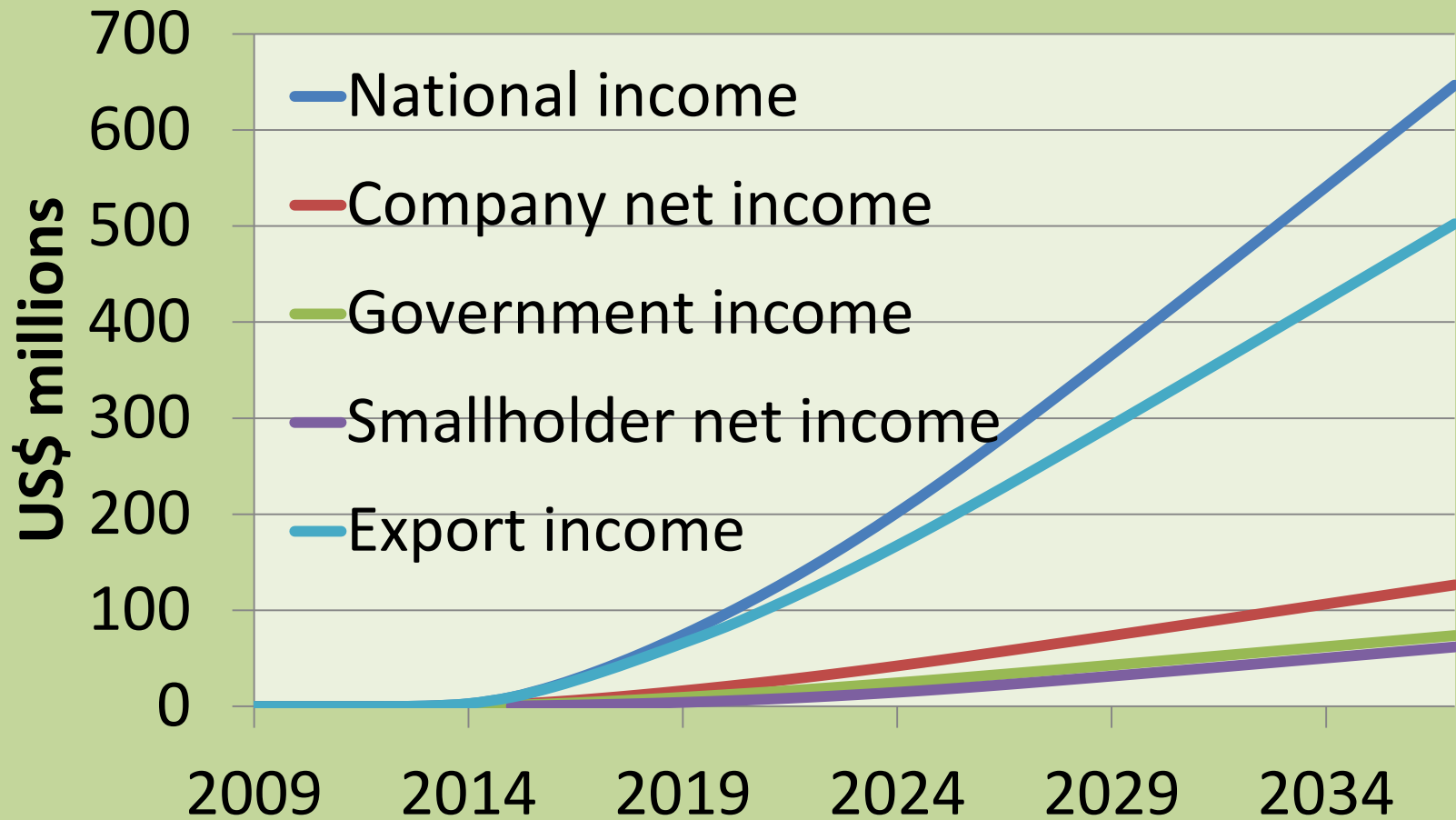


Figure 9

