



The Economics of Deforestation

Suzi Kerr

Motu Economic and Public Policy Research

International Economics Association

Roundtable

13-14 July 2007 Beijing

Outline

1. Drivers of deforestation
2. Why is deforestation ‘excessive’?
3. Global deforestation and climate change – from an Earth System perspective
4. Avoiding excessive deforestation
 1. Design of international climate change policy
 2. Domestic policies to avoid deforestation



Drivers of deforestation

1. Conversion of forest land to agriculture
2. Logging
3. Fuel wood

Conversion of land to agriculture

Convert if:

Profit in agriculture net of clearing costs $>$ profit in forest

and

The growth rate of future profit if they wait (e.g. for clearing costs to fall) is lower than the discount rate

Empirical work: land use/cover change

Early work

- Stavins and Jaffe (US)
- Chomitz and Gray (Belize) - roads
- Pfaff (Brazil) - population

More recent examples

- Kerr, Pfaff and Sanchez – Costa Rica
- Cropper et al – Thailand;
- Geoghegan et al – Mexico
- Rozelle, Deng Xiangzheng et al – China



Growth and deforestation

- Cropper and Griffiths (1994) – population growth
- Foster and Rosenzweig (2003) – demand for forest products
- Kerr, Pfaff and Sanchez – increased pressure followed by decrease over time

Household scale modelling

Logging

Harvest if:

Profit from timber + future agriculture profit >
future profit from standing forest

and

The increase in profit from waiting (e.g. for
timber prices to rise or harvesting costs fall) is
less than the return on capital



Empirical work

Logging followed by conversion

- Previous empirical work applies

Global demand and supply for forest products

- Sohngen and Sedjo

Why is deforestation ‘excessive’?

If benefits to society exceed full economic, social and environmental costs, deforestation is good.

Why would deforestation occur when benefits don't exceed costs?

Why is deforestation excessive: externalities



Local

- protect soils
- water quality and stability of water flows
- non-timber forest products

Regional

- Air quality
- Indigenous cultures

Global

- Climate change
- biodiversity



Why is deforestation excessive: institutions

- Poor governance - corruption
 - State capture: laws designed to benefit small group
 - Administrative corruption: undermining of laws by officials implementing them
- Poorly defined property rights
 - Insecurity of tenure
 - Clearing or 'development' of land creates property right

Why is deforestation excessive: landowner level

- Lack of information on land's potential
- Lack of access to markets
 - capital and risk (extensive agriculture; early realisation of asset)
 - labour (no alternative livelihood)

Global deforestation

No global, economics-based model of land use exists

We need one to explore critical global change scenarios

- future climate change impacts from deforestation
- potential contribution of avoided deforestation to climate change mitigation effort.

Land cover data exists as do land suitability indices, population maps...

Avoiding deforestation

1. Design of international climate change policy
2. Domestic policies to avoid deforestation

Design of international policy for avoided deforestation

- Why the ‘Clean Development Mechanism’ is not the way forward
- A possible global system – why start by assuming second best?

Why the ‘Clean Development Mechanism’ is not the way forward

- No environmental certainty
- High cost – low efficiency
- Effective mechanism for knowledge/technology transfer?



No environmental certainty

- In theory CDM has no environmental effect because only 'additional' reductions are given credit.
- In reality additionality is impossible to assess
 - Effects outside the project area – leakage – is extremely difficult to determine and likely to be underestimated
 - Adverse selection creates a systematic bias that is environmentally damaging.
- Complexity and discretion encourages corruption. We need to avoid local corruption infecting the international system.

Voluntary Participation

Adverse selection

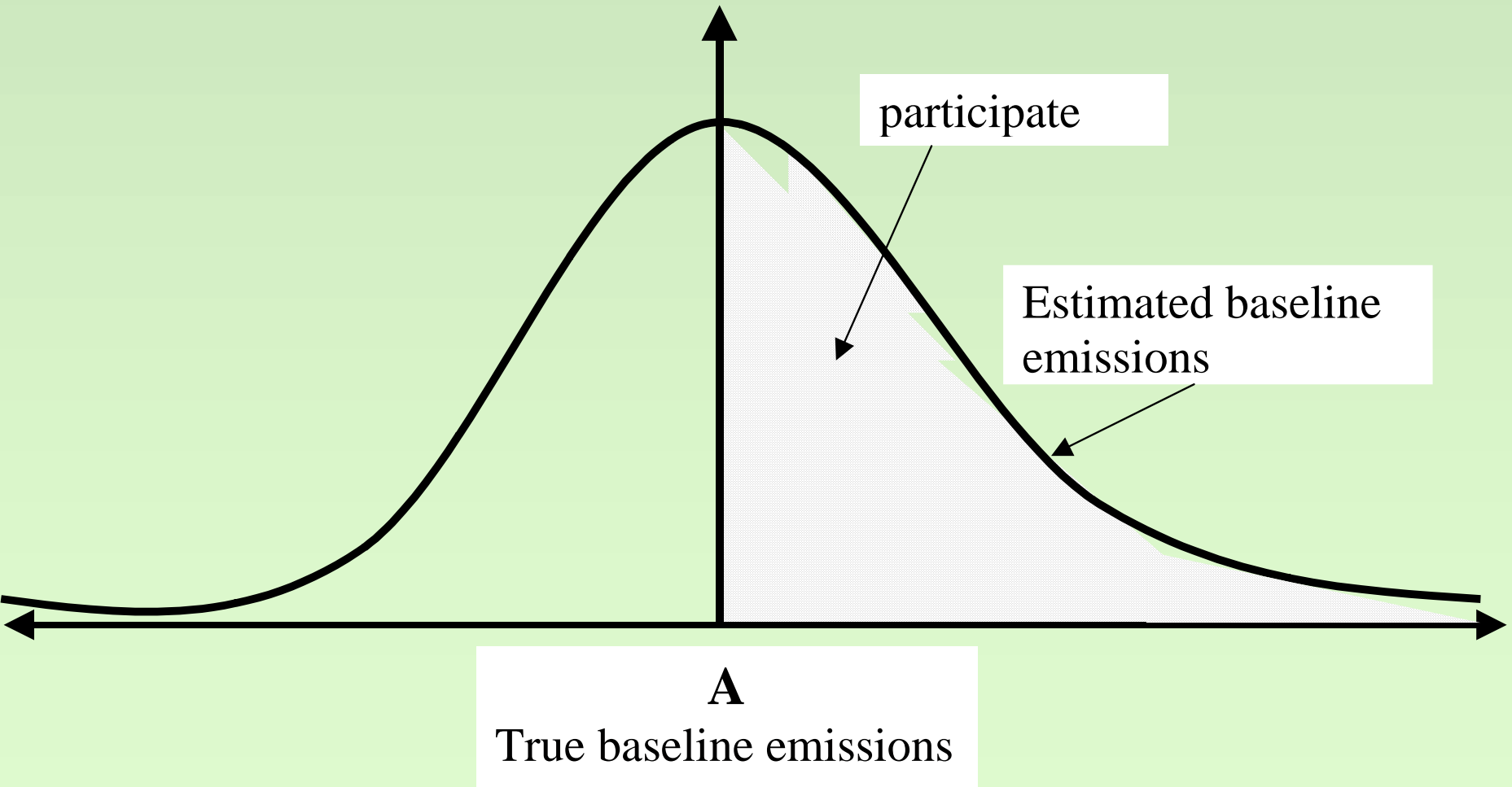
- Landowners have more information than ‘government’ on true baselines

Participate iff:

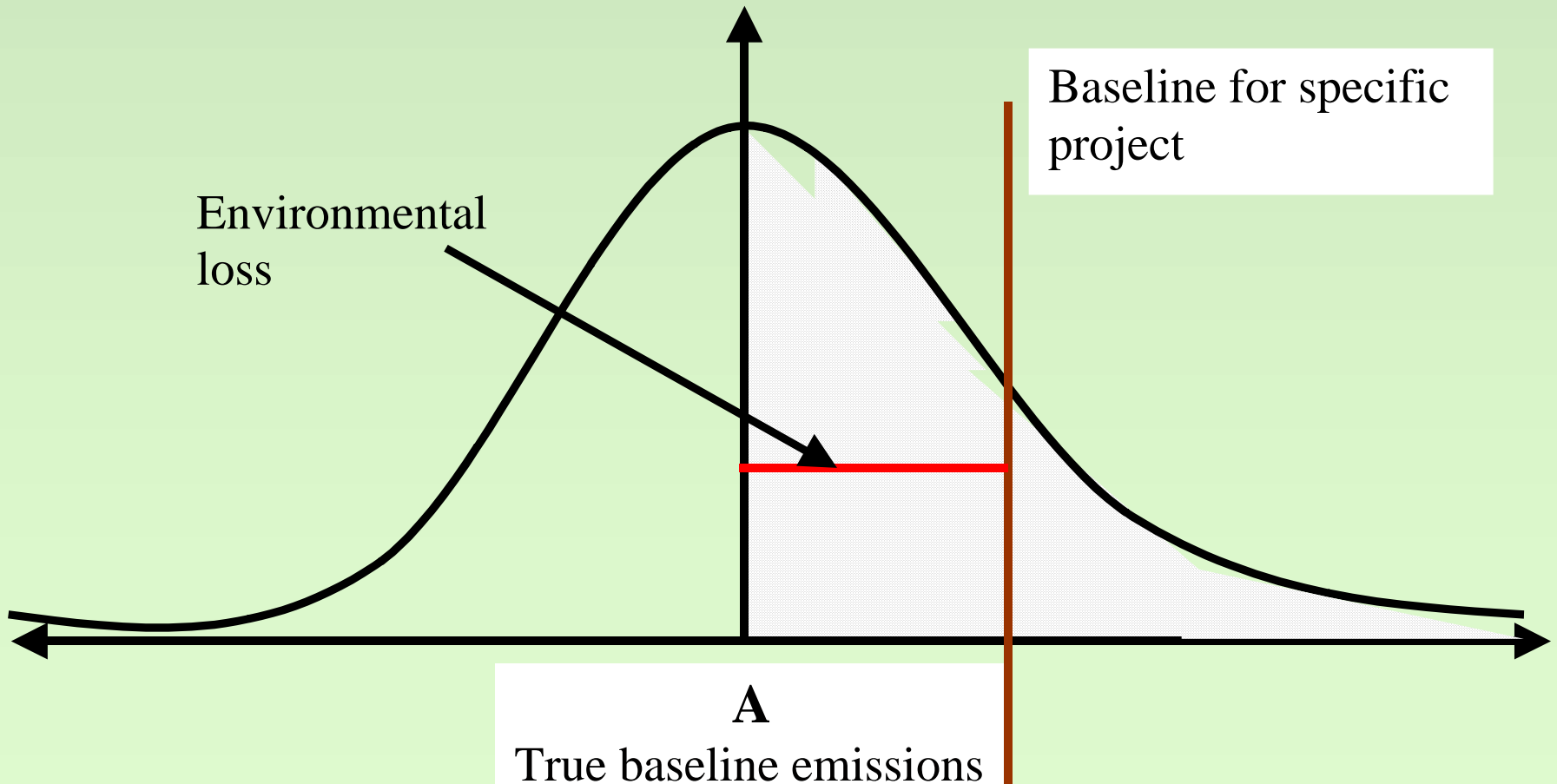
Profit from true supply $>$ Baseline liability

Systematic bias toward environmental loss.

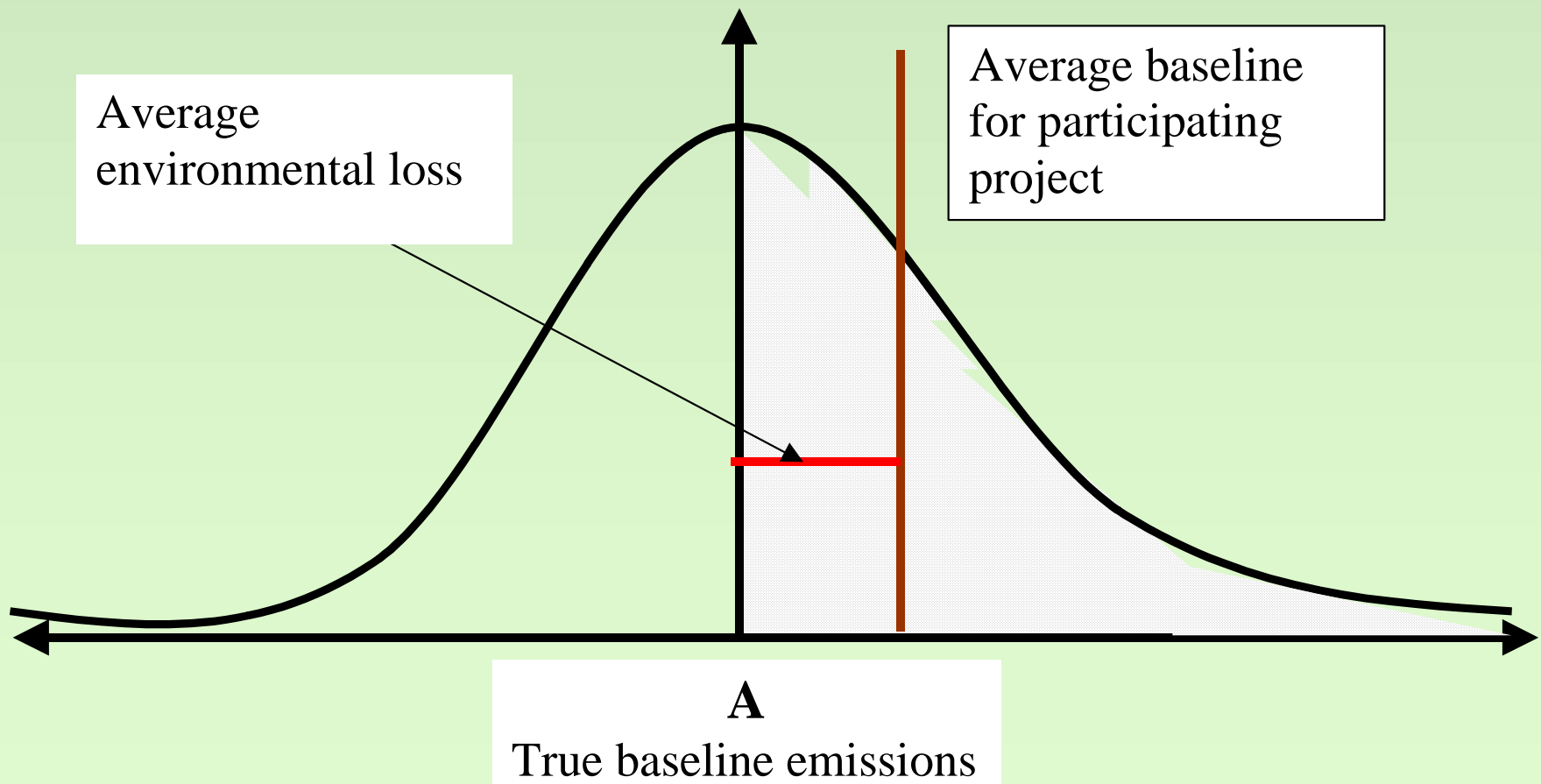
If price = 0



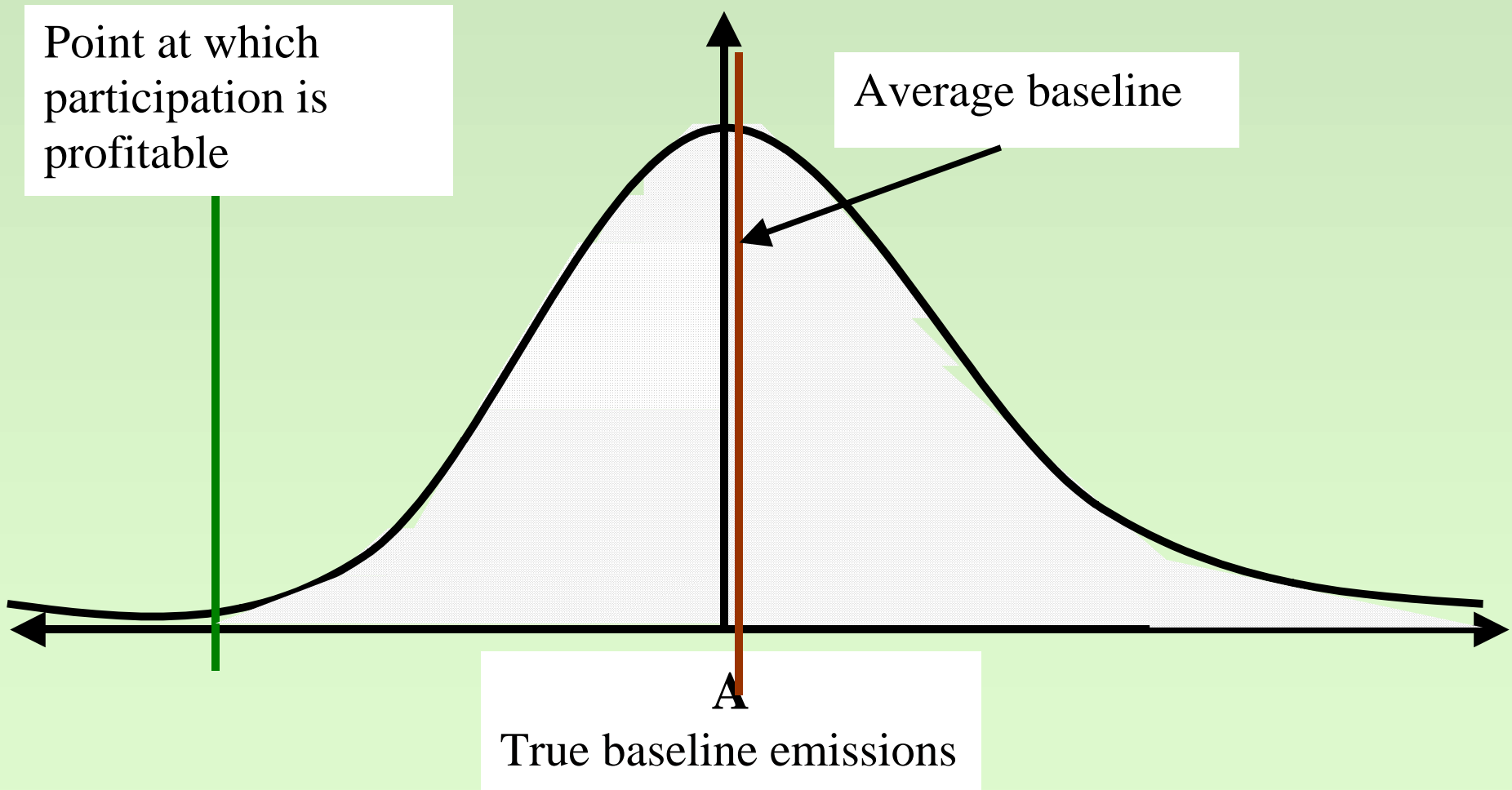
Loss from specific project



Average environmental loss with zero price



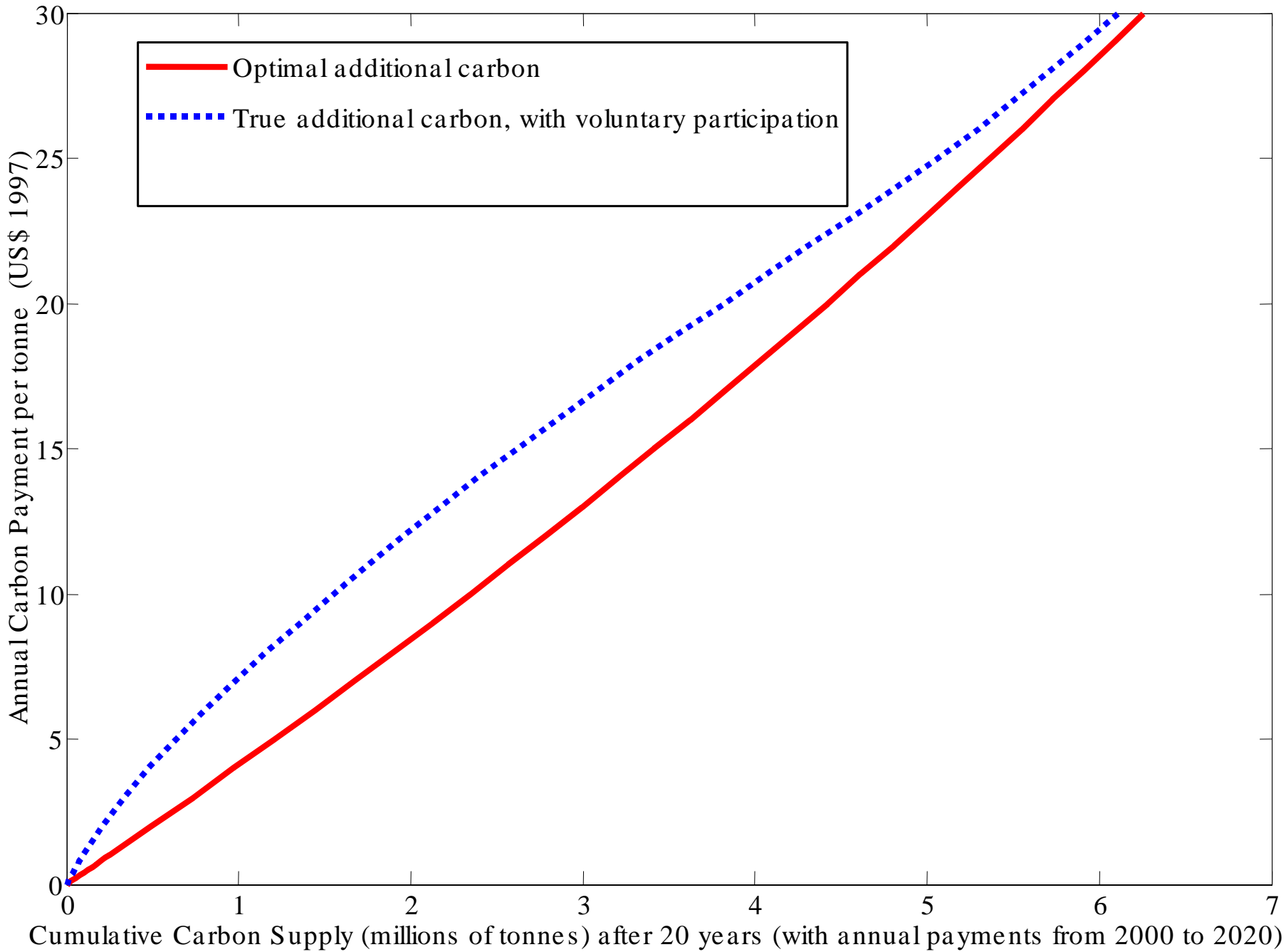
High price - no loss

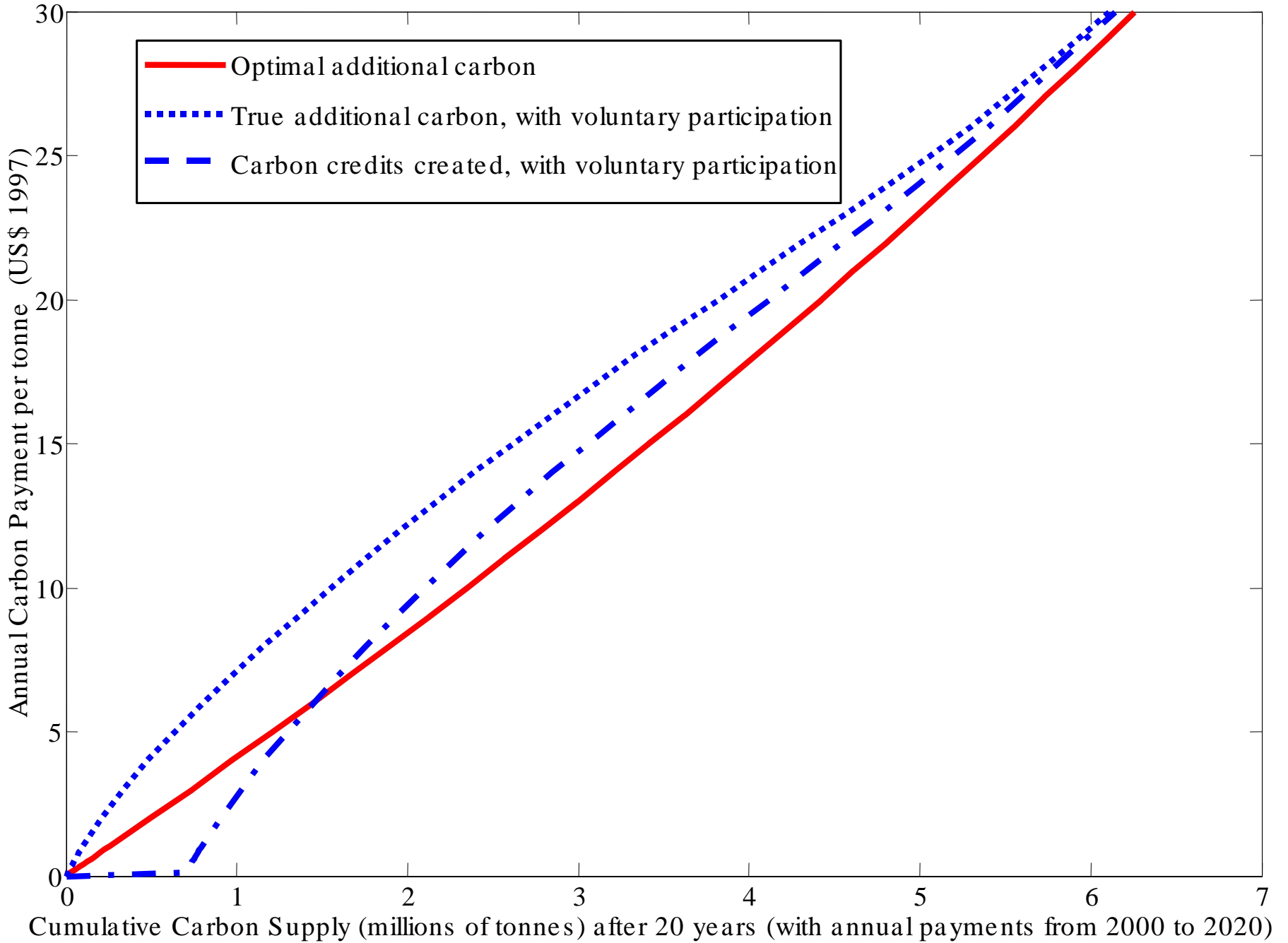




Is this a real problem empirically

- We use an econometrically estimated model of deforestation in Costa Rica
- We estimate baselines for 'projects' that involve an entire district
- We also estimate the uncertainty faced by an external regulator (ourselves) and the landowners – who know everything except commodity prices
- We simulate entry and behaviour at different price levels.







We underestimate the problem

- Relatively sophisticated baseline estimation
- Very large projects so less heterogeneity
- We do not take account of the effects of corruption

High cost – low efficiency

- Not accessible to poor/small players
- Cannot induce institutional reforms or changes in large infrastructure projects (e.g. not building a road) or widespread changes in consumer behaviour

A possible global system

- Need to build developing country trust through credible Kyoto responses in Annex I countries
- Need low/no net cost to developing countries in first commitment period when they enter.
- The architecture of Kyoto for Annex I is basically sound: monitoring; trading provisions....
 - Therefore apply this to developing countries where possible.

2 level approach

- 1 Countries that can develop a credible national (or even sectoral) inventory and monitoring plan that meets IPCC guidelines.
- 2 Countries that cannot – stay with project type but with emphasis on technology/knowledge transfer.

Level 1: allowance allocation – setting a national deforestation baseline

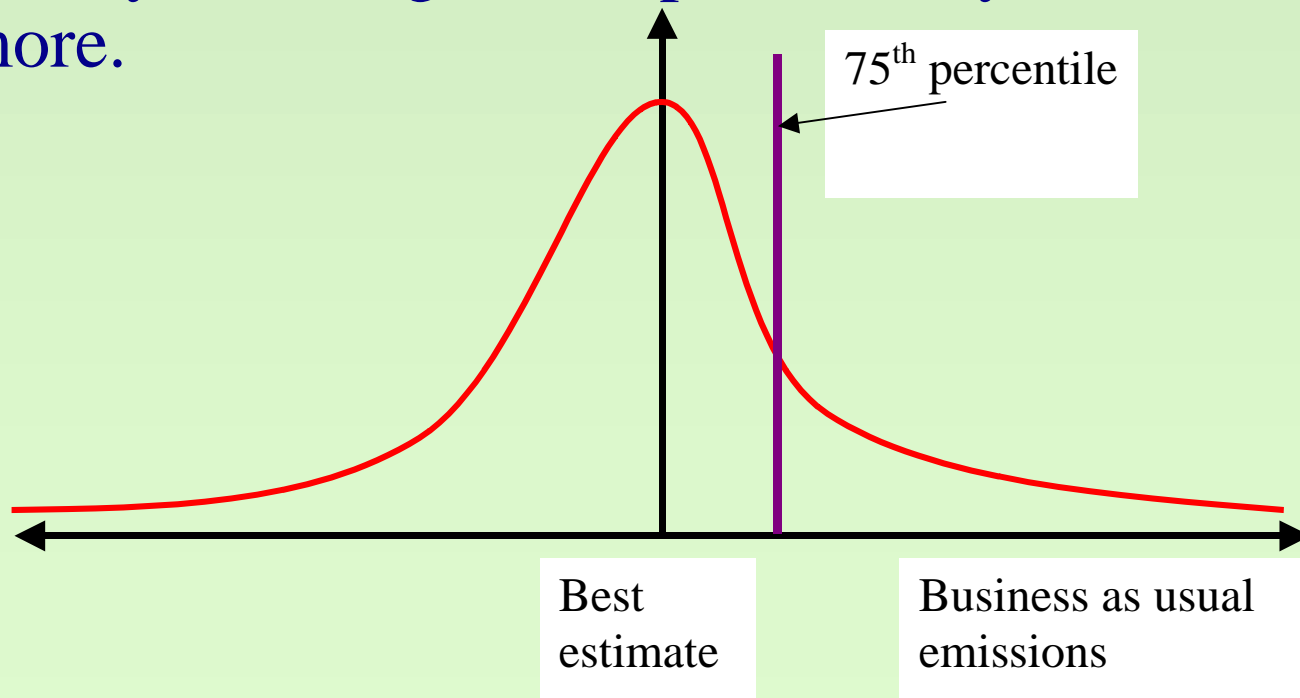
National level allowance allocation set to come close to ‘business as usual’ (BAU).

- Need to estimate business as usual
- Minimise risk in projections by making the allocation a function of GDP (largely exogenous to climate policy)

Two possible ways to set baseline

1 Reduce risk to developing country by setting baseline high

Offset by reducing developed country allocations more.



2 Set at best estimate but no liability if they exceed.

- If BAU were perfectly estimated they would never exceed.
- If they exceed and opt to not have liability they must also replace any allowances they have already sold.
- They would face the same year-by-year rules to minimise overselling risk as Annex I.
- Need to offset because expected level of emissions is now higher than than BAU. They sell an excess if are lucky and real BAU is low. They do not buy if they are unlucky.



Level 1: Monitoring of actual deforestation

Monitor by satellite and using models of carbon storage

- Currently can monitor only land cover on a global scale – could be supplemented with country-specific data in some cases.
- By 2015 we should be able to monitor forest degradation in a globally consistent way.
- For some areas models of carbon storage will still be highly uncertain



International policy summary

CDM and projects in general are seriously problematic.

National level baselines and monitoring are possible and more credible.

Domestic policies to avoid deforestation

Climate change policy potentially offers significant rewards for avoiding deforestation.

Having a credit based international system does not mean that domestic policies need to be credit based or even economic instruments.

They simply must produce real, measurable gains at the national level.

The potential credit revenue can facilitate implementation of some policies.

Address the key drivers of local deforestation.

- If the primary cause of excessive deforestation is corruption, policies that do not address corruption will be ineffective.

Address the key drivers of local deforestation.

- If potential agricultural returns are high, policies that do not replace income will be ineffective.

Address the key drivers of local deforestation.

- If local people have no alternative livelihood, policies that do not move people will be ineffective.

Address the key drivers of local deforestation.

- If key drivers arise at the national level (e.g. forestry laws) or even international (demand for timber), policies that are purely local will have limited effect.



Take account of institutional strengths and local capability

If local deforestation is excessive because of local externalities or local corruption, these can be thought of as local commons problems.

Corruption is the inverse of cooperation.

In these cases, Ostrom's suggestions for effective ways to build cooperation are extremely useful.

Focus on policies with local benefit first

- Because of externalities and corruption, there are frequently significant local benefits from reducing deforestation.
- Less risk for developing country from climate agreement
- Likely to be more support / less resistance
- Climate change benefits are a complement rather than the primary driver

What can other countries do to help?

- Provide technical assistance
- Assume some climate change price and policy risk by purchasing credits / providing funding in advance
- Reduce demand for illegal timber in their own countries

Policy conclusions

- Policy should focus on ‘excessive’ deforestation only
- CDM is a poor approach for avoiding deforestation
- The drivers of deforestation vary significantly across space – policies to address it should also



Rich opportunities for new research

- Rapidly increasing data availability and new tools for spatial econometrics
- Significant questions at global level that are largely unaddressed
- Important institutional design issues

A lush, dense tropical forest scene. The foreground is filled with various green plants, including ferns and broad-leafed shrubs. In the mid-ground, there are several palm trees with long, feathery fronds. The background is a thick canopy of trees, with some sunlight filtering through the leaves, creating a dappled light effect. The overall color palette is dominated by various shades of green, from bright lime to deep forest green.

www.motu.org.nz