Constructing reference levels for REDD+:
Strengths and limitations of economic modeling

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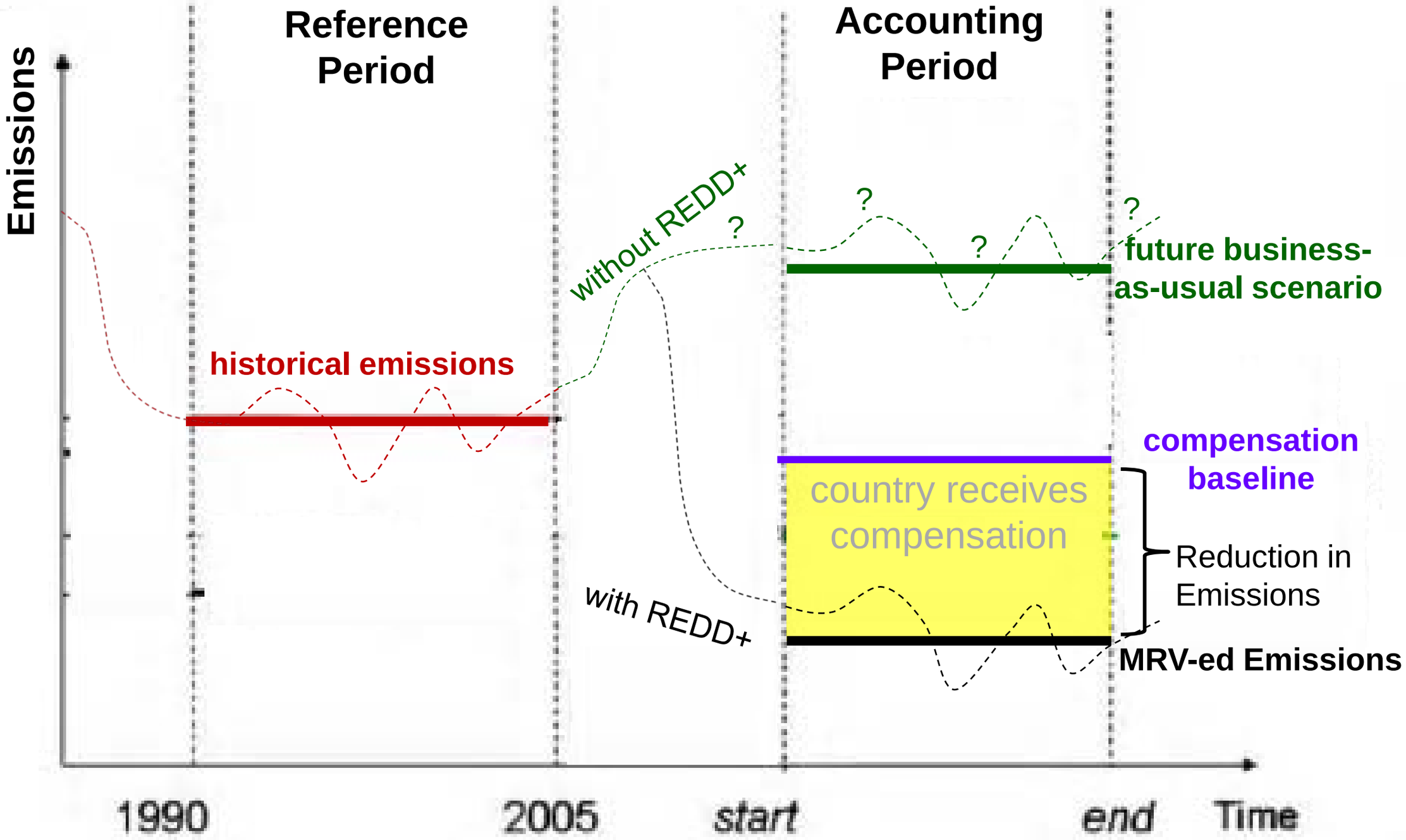
http://www.conservation.org/osiris

Distinguishing three reference level concepts



Adapted from Mollicone et al., 2007

historical emissions
compensation baseline
future business-as-usual scenario(s)

historical emissions

- objective, science-based estimate
  of emissions [and removals] from
  forests over a recent historical period
- there is a true number, although we may
  never know it exactly
- requires decisions about scope,
  reference period, forest definition, etc.
- requires data on forest cover change
  and emission factors
- conservative accounting can provide
  incentive to reduce uncertainty
- could contribute to determination of future BAU
  scenario(s); compensation baseline

future business-as-usual scenario(s)

- anticipated emissions in absence of REDD+ (ultimately unknowable)
- can be projected with assumptions, extrapolations, and/or modeling
- multiple future scenarios might be justifiable
  (e.g. w/ or w/o other countries taking actions to reduce deforestation)
- useful as a benchmark of mitigation achieved
- useful for national REDD+ strategy and planning
  (e.g. geographically targeting pilot programs within a country)
- could contribute to determination of compensation baseline
- Meridian: “reference level”

historical emissions → **compensation baseline**

- essential element of any results-based, pay-for-performance, REDD+ mechanism
- produces incentives which countries respond to by opting in/out, reducing/increasing deforestation, affecting:
  - climate change mitigation effectiveness
  - amount and equity of payments
  - cost-efficiency of mechanism
- much lit to date: "reference level"

future business-as-usual scenario(s)

compensation ($/yr) = [compensation baseline (tCO_2e/yr) – MRV-ed emissions (tCO_2e/yr)] * payment per ton of carbon ($/$tCO_2e$)

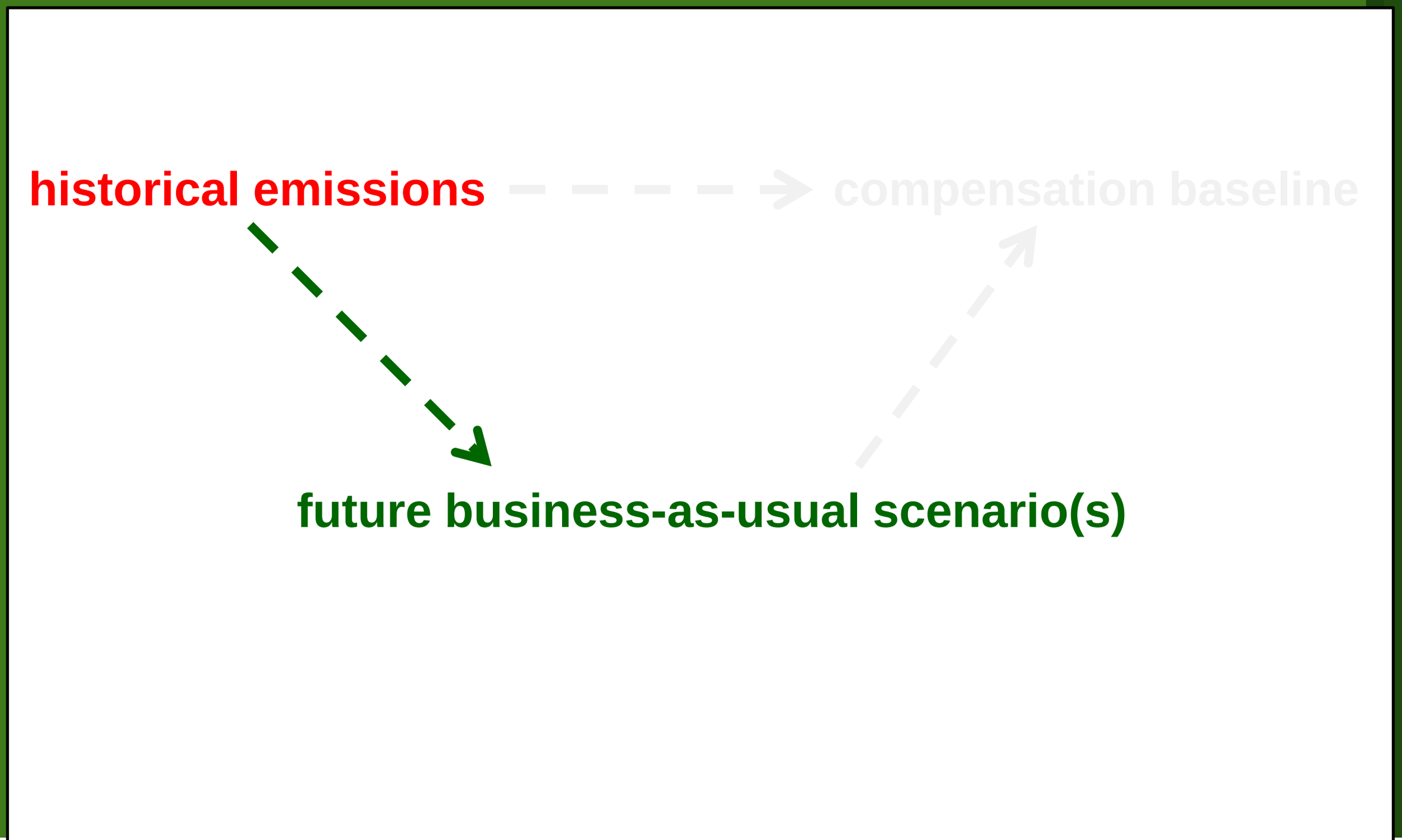
area (ha) could be used as proxy for emissions (tCO_2e)

historical emissions → **compensation baseline**

potential methodological components ("adjustments for national circumstances")

- unadjusted historical emissions
- adjustments to align with future BAU scenario(s)
- upward adjustments to address anticipated international leakage
- upward adjustments based on equity and/or development considerations
- downward adjustments to leverage countries' "own efforts"
- downward adjustments reflecting additionality concerns
- adjustments based on other global/system-wide integrity considerations
- adjustments over time

Economic modeling of future business-as-usual scenario(s): strengths and limitations



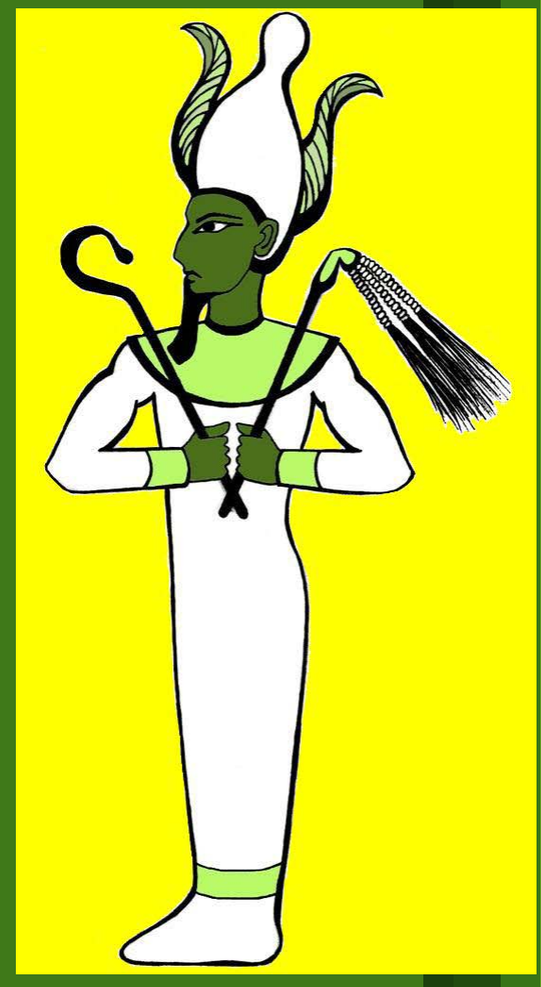
Lessons from economic modeling of deforestation

•OSIRIS: A suite of free, transparent, online, open-source, spreadsheet-based decision support tools to estimate and map the climate and revenue benefits of alternative international and national REDD+ policy decisions

•Global model: 85-country partial equilibrium of agriculture, timber
(Busch et al. 2009, *Environmental Research Letters*)
(Cattaneo et al. 2010, *Environmental Science and Policy)*

•National models: spatial econometric land-use change models for Indonesia, Peru, Madagascar, Mexico…
(Busch et al. revision in review, *PNAS*)

•http://www.conservation.org/osiris



Osiris, Egyptian god of vegetation. L. Busch

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Strengths of economic modeling for predicting future BAU scenario(s)

- Good at detecting underlying spatial patterns in deforestation
- Good at disentangling multiple causal factors
- Forecasting future trends in “driver” variables (e.g. population; infrastructure; agricultural trends) may (or may not) be easier than forecasting future trends in deforestation directly
- Deforestation rate is easier to predict at higher spatial scales

Limitations of economic modeling for predicting future BAU scenario(s)

- Different data sets, different combinations of driver variables, or different assumptions can lead to different predictions, even when all are technically correct

- Even after including many variables, data on drivers still explains only a portion of spatial variation in deforestation

- Complex statistical methods may be difficult to explain

- A greater evidence base from multi-period deforestation data sets is needed to evaluate whether or not economic modeling outperforms historic average, historic trend, or simple adjustments at predicting the rate of future deforestation

Economic modeling of future BAU emission scenario(s) can be very useful for national planning

- Predicting impacts of payments and policies (e.g. “marginal abatement cost curves”)

- Evaluating achievability of national commitments

- Geographically targeting pilot programs for greatest impact

- Geographically distributing RLs, quotas or allowances within countries

- Designing efficient, effective, equitable multi-scale economic incentive structures for REDD+ within countries (e.g. basic voluntary incentives vs. improved voluntary incentives vs. cap-and-trade)

In summary:

- An exact, “true” level of historical emissions does exist; the level of certainty with which it can be estimated depends on data
- A compensation baseline and MRV-ed emissions are the two absolutely essential elements needed to operationalize a results-based, pay-for-performance REDD+ mechanism
- Predictions of future business-as-usual emissions, even when technically sound, are sensitive to subjective choices about data, included variables, and assumptions
- Statistical methods can be used to detect spatial patterns in deforestation, and increase in explanatory power at higher spatial scales, but complex methods may be difficult to explain
- Future business-as-usual emissions scenario(s) are useful as a benchmark of performance, and very useful for national planning

Thank you!

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Many collaborators and partners

For more information:

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