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From global to local: managing the natural capital of the world's forest

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Worth

Value of plants is US$ 35 trillion annually

Forests contribute 47%

Loss

Tree cover lost at rate of >100,000 km^2 per year

Short-term monetary returns drive loss

Which scale is appropriate?

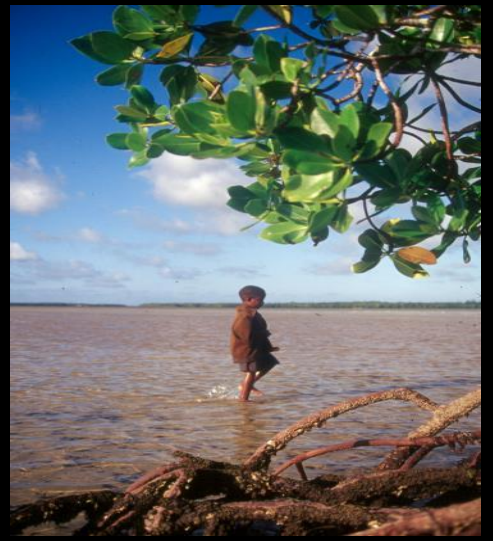
Global

Key regulators of planet's oxygen, carbon and climate

Massive scale timber export markets

Local

Sustainable use of forests, restoration, and land-use decisions



Three case studies

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1. Tanzania

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2. China

Three case studies

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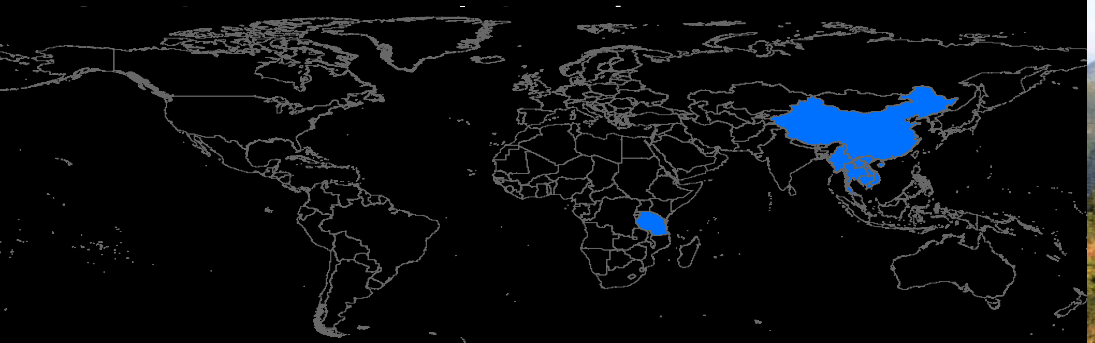
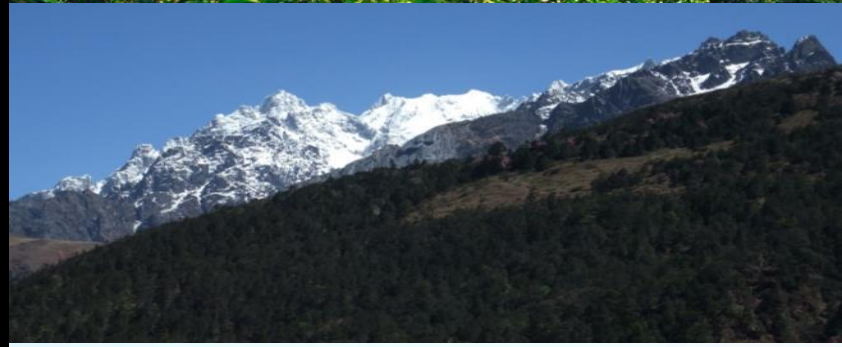
2. China





Case study 1: Tanzanian coastal forests

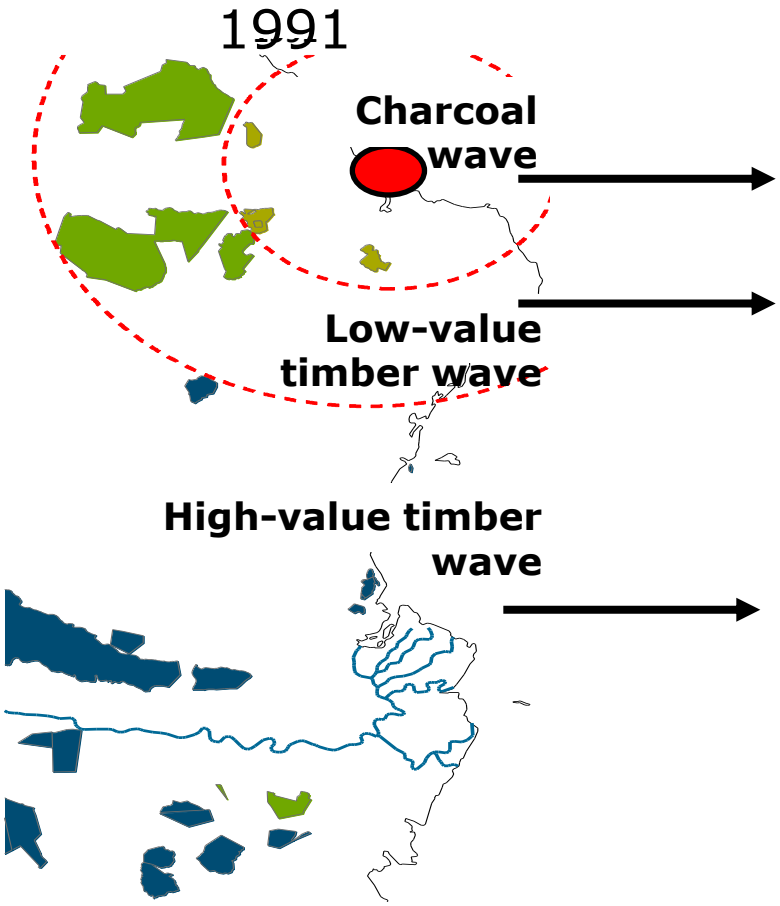
Can degradation be predicted?

Can degradation be predicted?

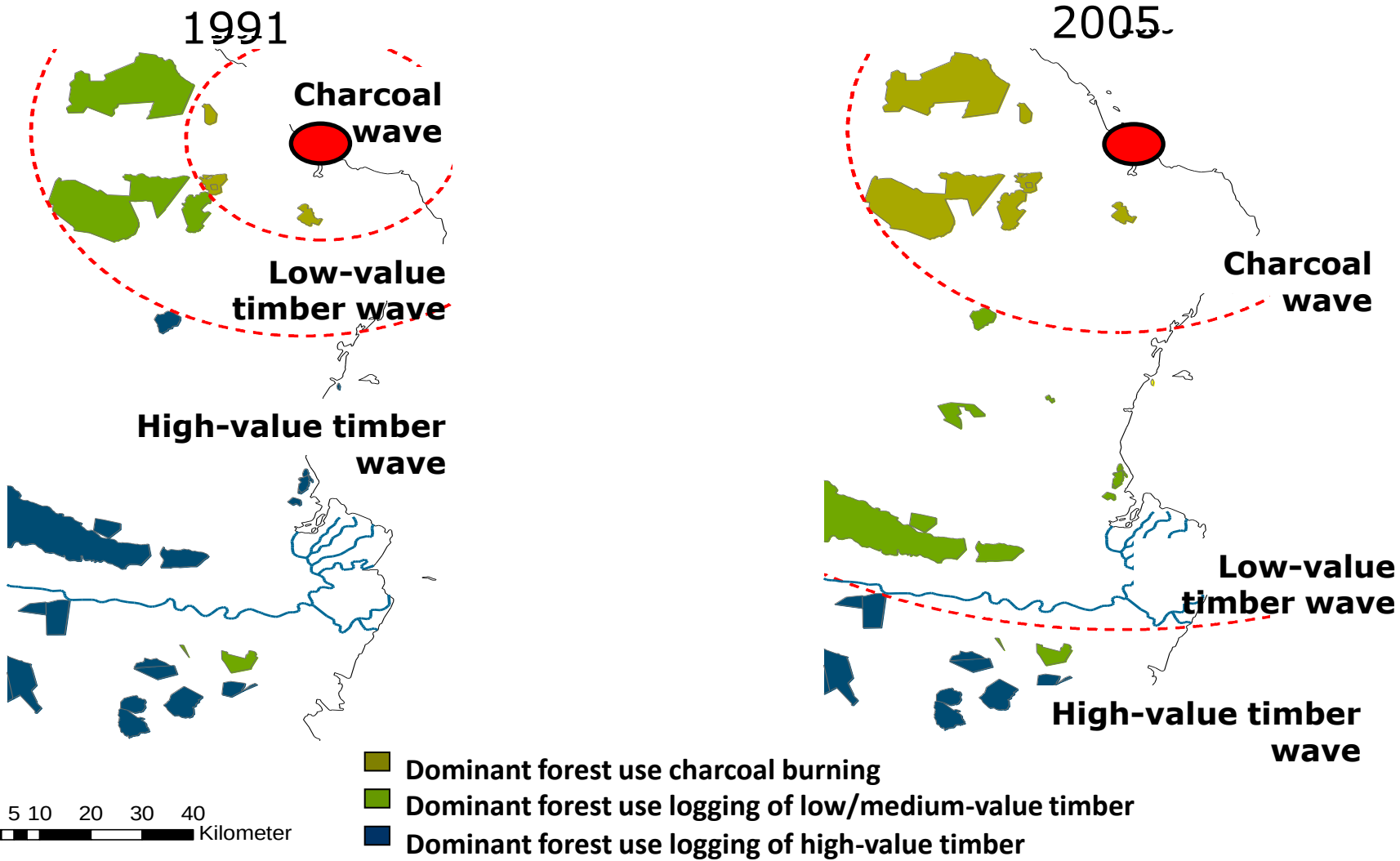
High value timber

Low value timber

Charcoal



Dominant forest use charcoal burning
Dominant forest use logging of low/medium-value timber
Dominant forest use logging of high-value timber


1991
Charcoal wave
Low-value timber wave
High-value timber wave
2005
Charcoal wave
Low-value timber wave
High-value timber wave
0 5 10 20 30 40
Kilometer
Dominant forest use charcoal burning
Dominant forest use logging of low/medium-value timber
Dominant forest use logging of high-value timber

The impacts were enormous

- Carbon storage dropped 10-fold. Biodiversity dropped 3-fold
- Loss in tax revenue US$ 53 million in 2005 alone
- High-value timber will be exhausted in c. 30 years

What difference did the study make?

- Intensification of controls on the ground
- Anti-corruption campaign
- Investment into Participatory Forest

Ahrends et al. 2010. *PNAS* 107: 14556

Case study 2: China


In the last decade China invested >US$ 100 billion for forestry

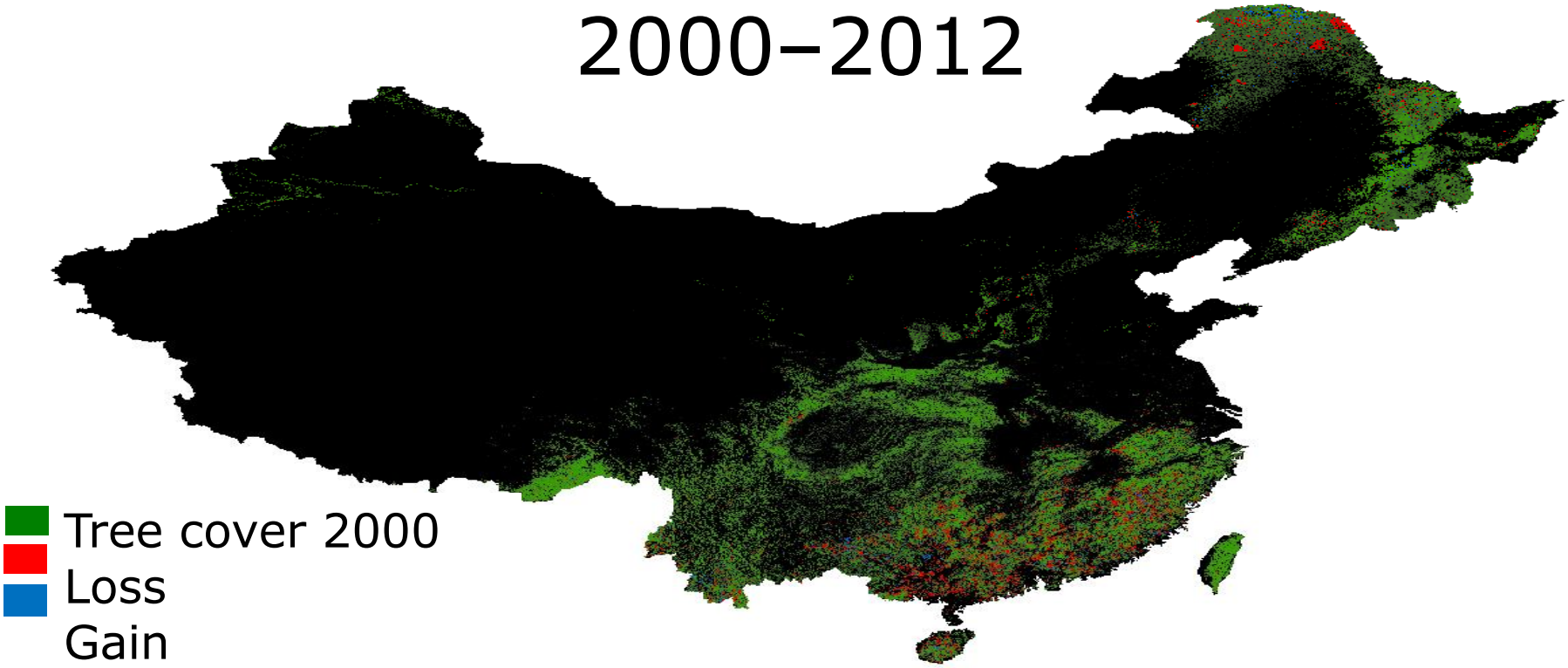
Tree planting

China has the world’s largest plantation area

It annually reports more afforestation than the rest of the world combined

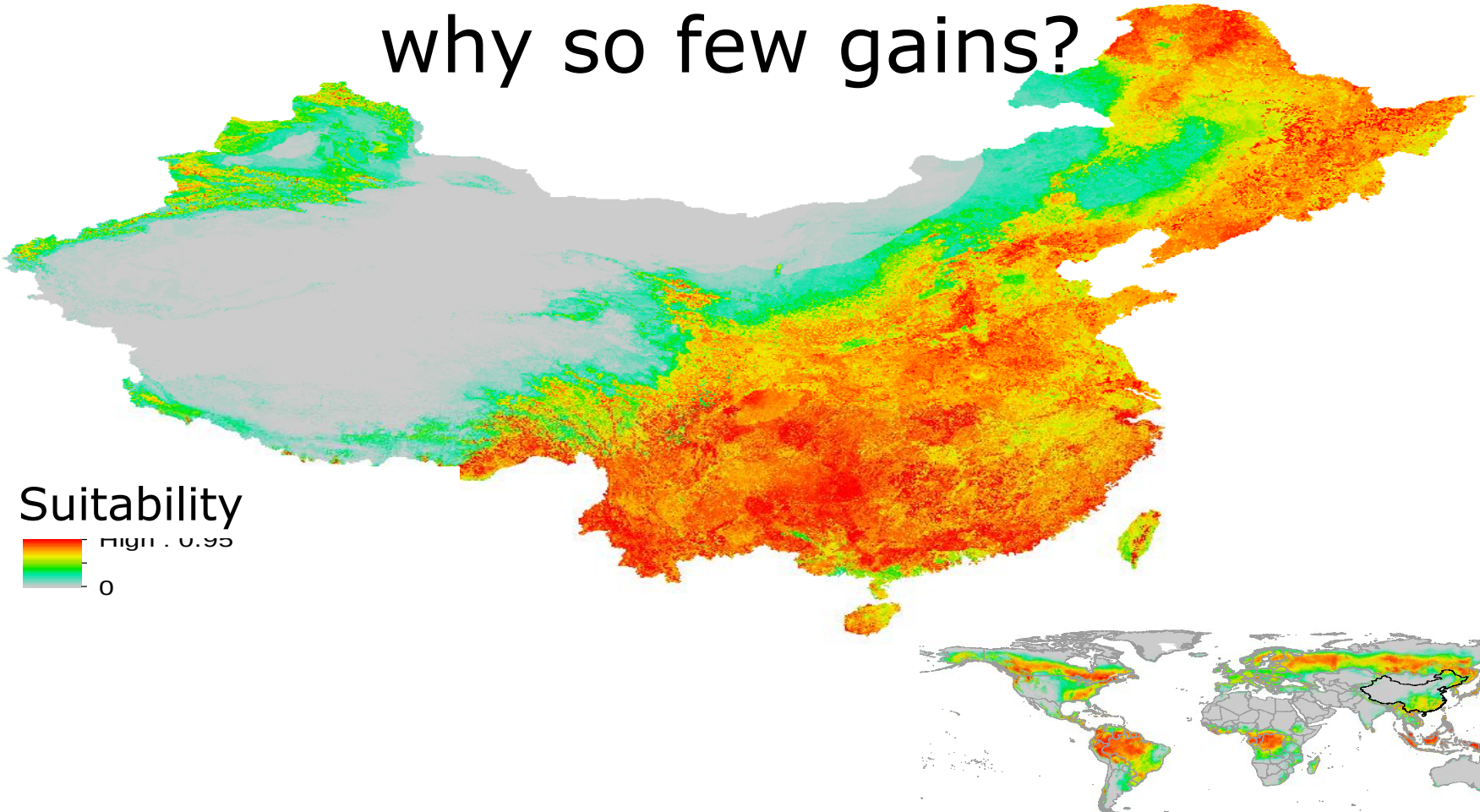
www.chinadaily.com.cn; www.oregonlive.com

China experienced a net tree cover loss 2000–2012



Hansen et al. 2013. *Science* 342: 850

If so many trees are planted, why so few gains?



China’s afforestation effort has focussed on climatically marginal areas

How do the trees survive at all?

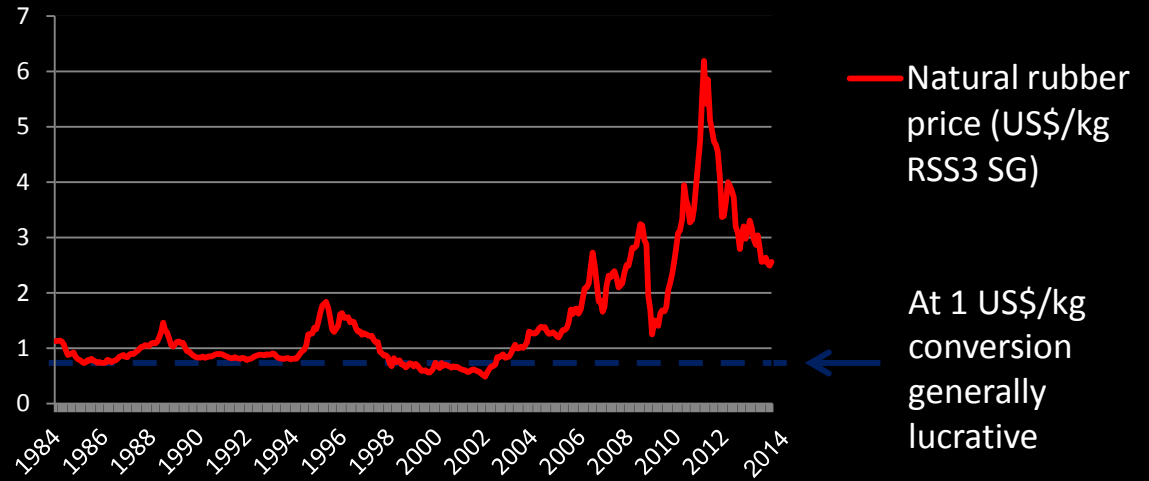
97% of the gains are associated with <50% of the investment

Case study 3: South East Asia

Natural rubber

Natural rubber (*Hevea brasiliensis*) major source of world's rubber for high pressure applications

Rubber prices have boomed in the last decade



Source: index mundi

Rapid conversion to rubber

credit: *Science* 2009 324:1024

credit: *Nature* 2009 457:246

credit: *Science* 2009 324:1024

In total there are >250,000 km^2 of rubber, having replaced over 45,000 km^2 of forest

What are the implications?

Rubber brought wealth to many impoverished areas

Significant loss of natural capital:

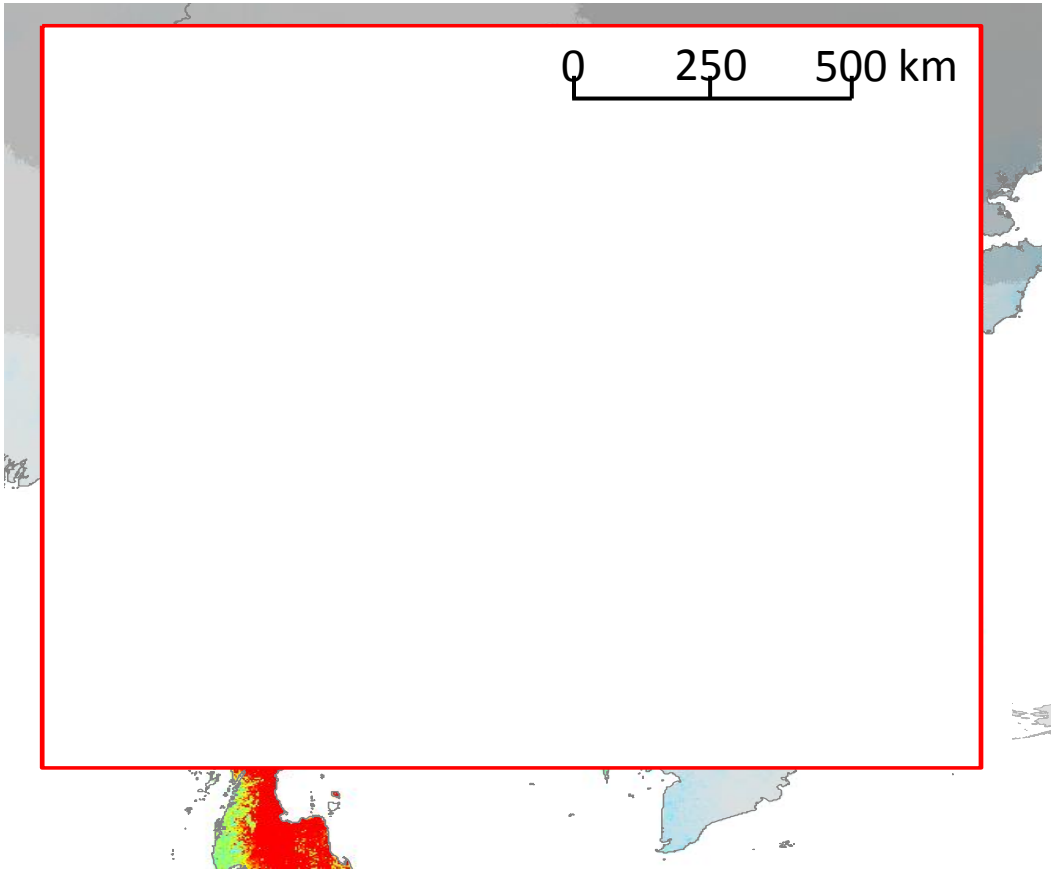
- Loss of biodiversity, soil productivity and water quality
- Risk of landslides


Xishuangbanna, China 2013


Laos 2009 (Mongabay)

Is rubber sustainable in marginal areas?

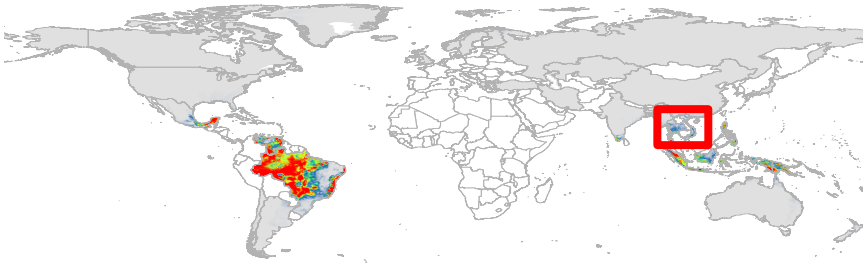
90% plantations in sub-optimal climate



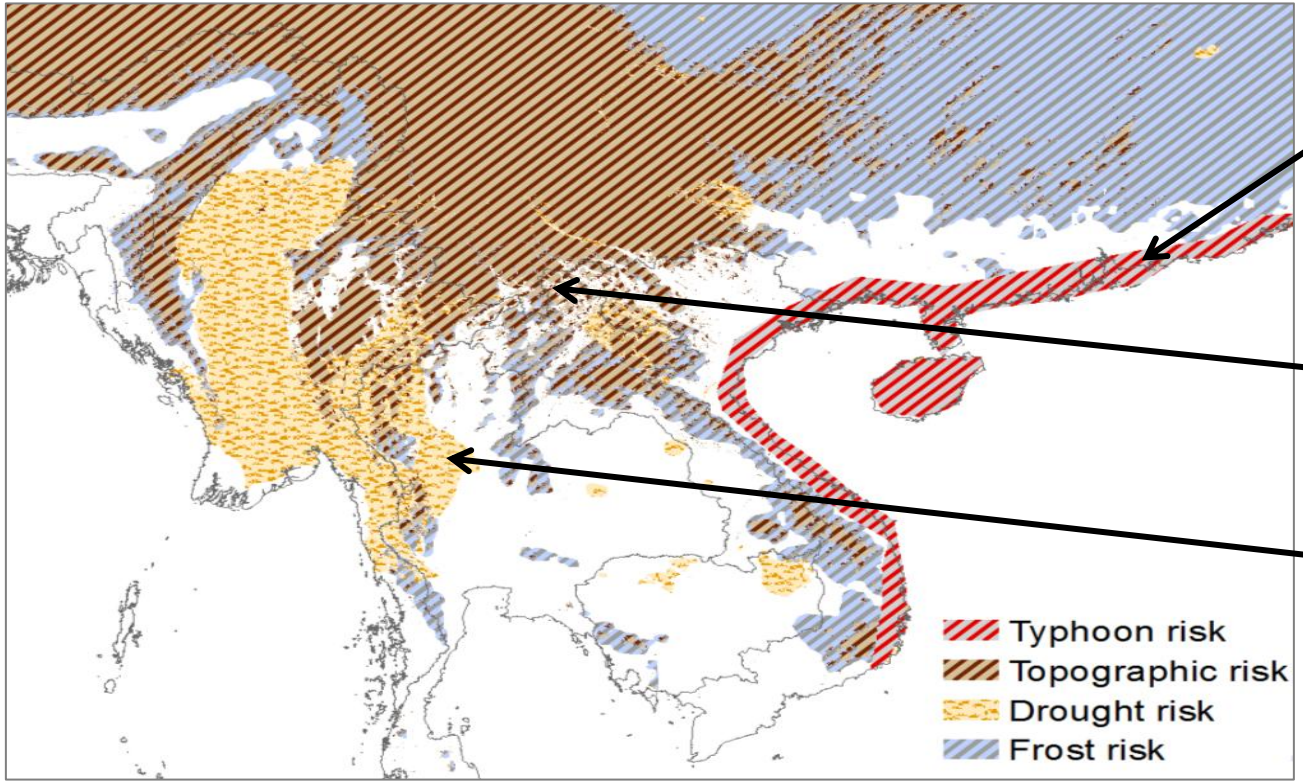
Continental South East Asia is the current hotspot of rubber expansion

There is not a lot of optimal growing space

However, in many of



57% of plantations situated in risk zones



>4,800 km^2 in zones with frequent extreme events (e.g. typhoons, frost)

>6,300 km^2 at >900 m altitude or on slopes >24^0

>800 km^2 in dry zone

Economic impacts of environmental damage

- US$ 250 Mio plantation loss, typhoon, Vietnam, 2013
- 95% plantation loss, cold weather, 4 Provinces in Vietnam, 2010
- US$ 26 Mio plantation loss, drought, South China, 2010

http://tuoitrenews.vn/society/13714/devastating-loss-of-rubber-forests-to-typhoon-wutip

Aim: avoidance of loss-loss scenarios

Ahrends et al. 2015. *Global Environmental Change* 34: 48

Conclusions

Societal benefits from nature are enormous

Global overviews can serve to optimise decision making

Royal Botanic Garden Edinburgh

Combining scales is key for sustainable management of forest natural capital

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