Climate change adaptation and forest biodiversity: Avoiding trade-offs when chasing resilience

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Climate change adaptation

The process of adjustment to actual or expected climate and its effects, seeking to moderate or avoid harm or exploit beneficial opportunities.

(IPCC 2019)

Humanity faces two wicked challenges this century:

Climate change & rapid widespread biodiversity loss

Are there warning bells that can alert us to when climate change adaptation strategies in production forests may be maladaptive for biodiversity?

Warning bells can ring soon after events like this

Recommended strategies to avoiding such outcomes, often involve attempts to increase forest resilience

Resilience

The capacity of a system to absorb disturbance and reorganize while undergoing change so as to retain essentially the same function, structure, identity, and feedbacks (Walker et al. 2004).

There are different pathways to resilience in production forests

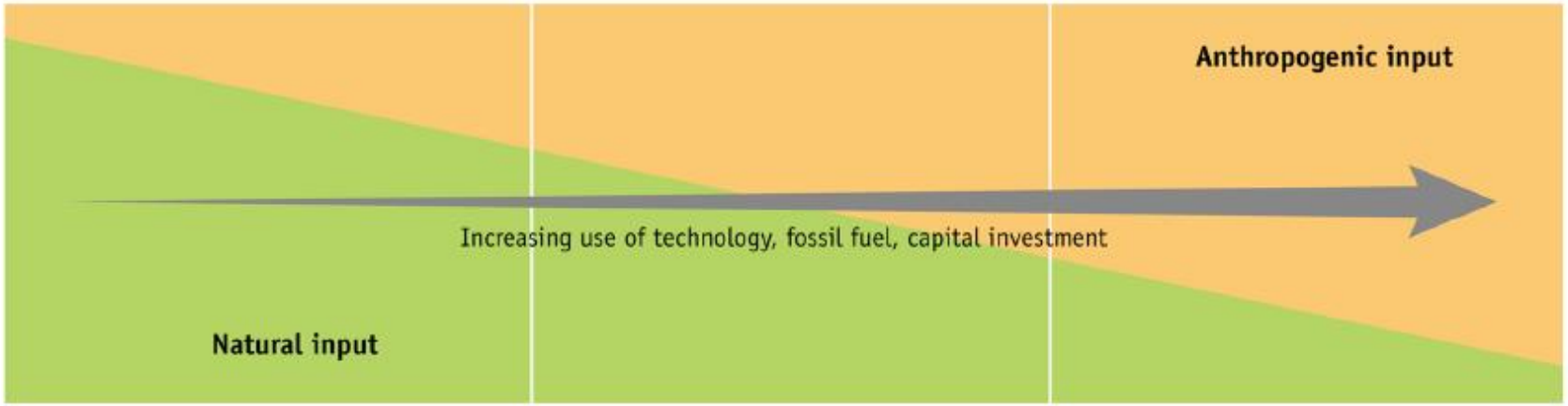
These can rely on natural versus anthropogenic inputs

The choice of which has direct implications for forest biodiversity

Resilience: Production forests fall along a continuum of natural to anthropogenic inputs

Ecological resilience
Relies on e.g. biodiversity, functional redundancy, ecological feedbacks

Coerced resilience
Relies less on ecological processes and more on human command and control



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Sweden’s conifer dominated approach to production forestry

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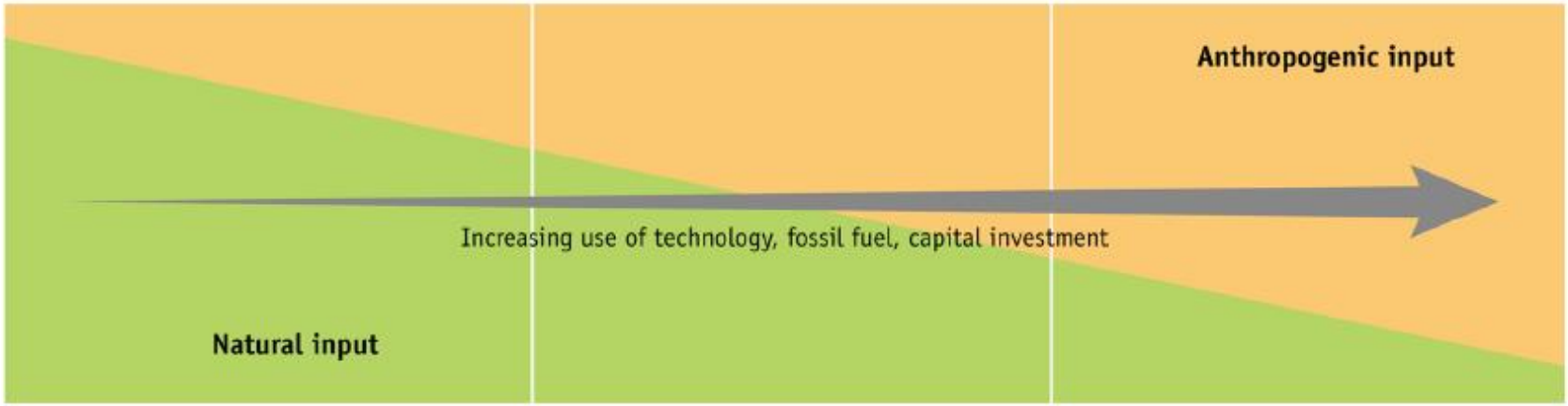

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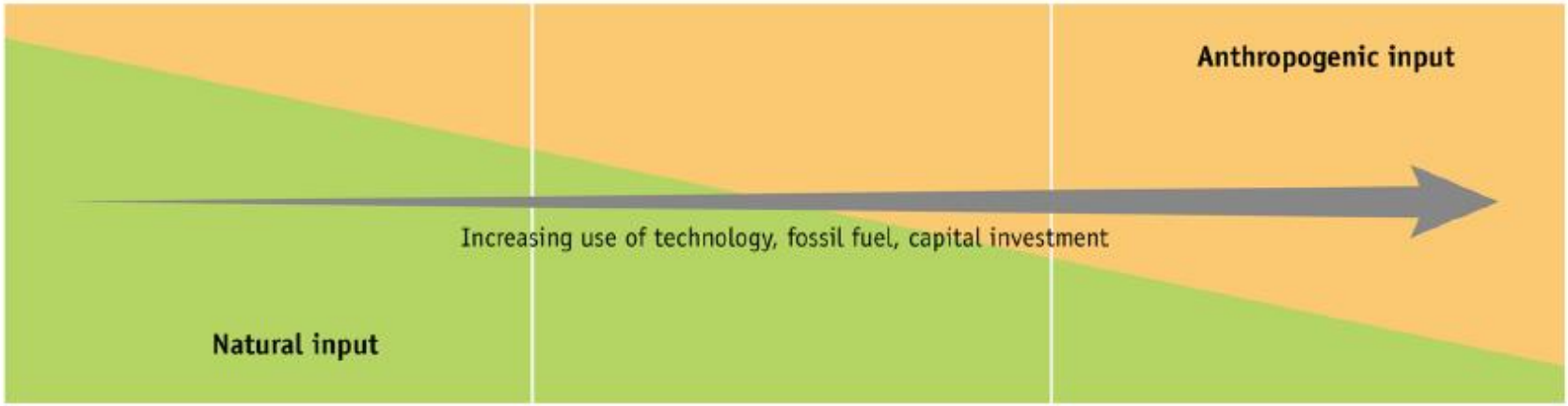
Pathogen risk?



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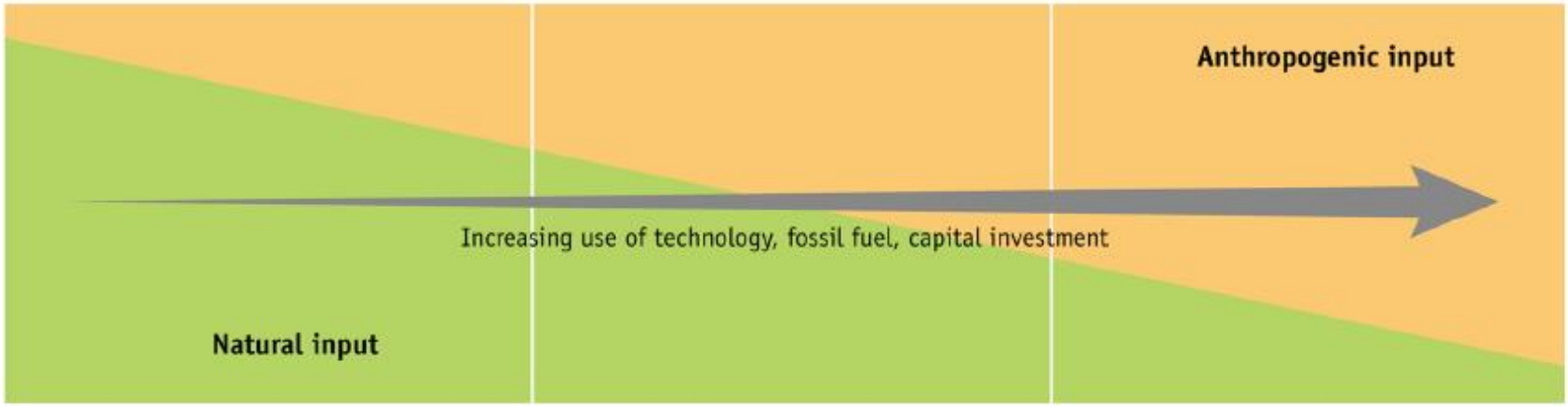
Fire risk?



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Windthrow risk?

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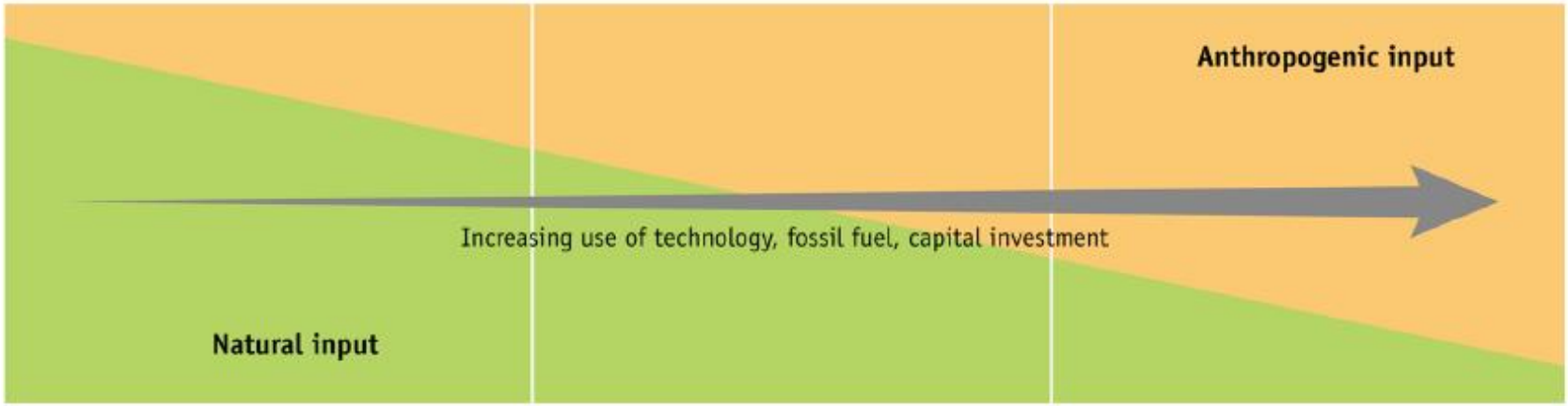

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Spruce bark beetle?

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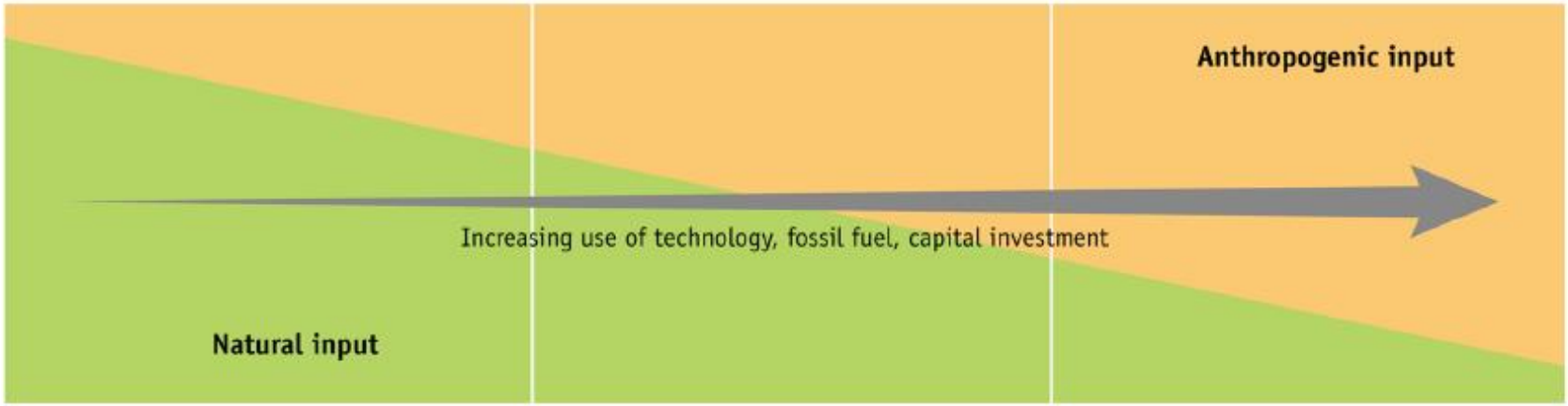

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The choices made will have direct impacts on forest habitat availability, and thus biodiversity

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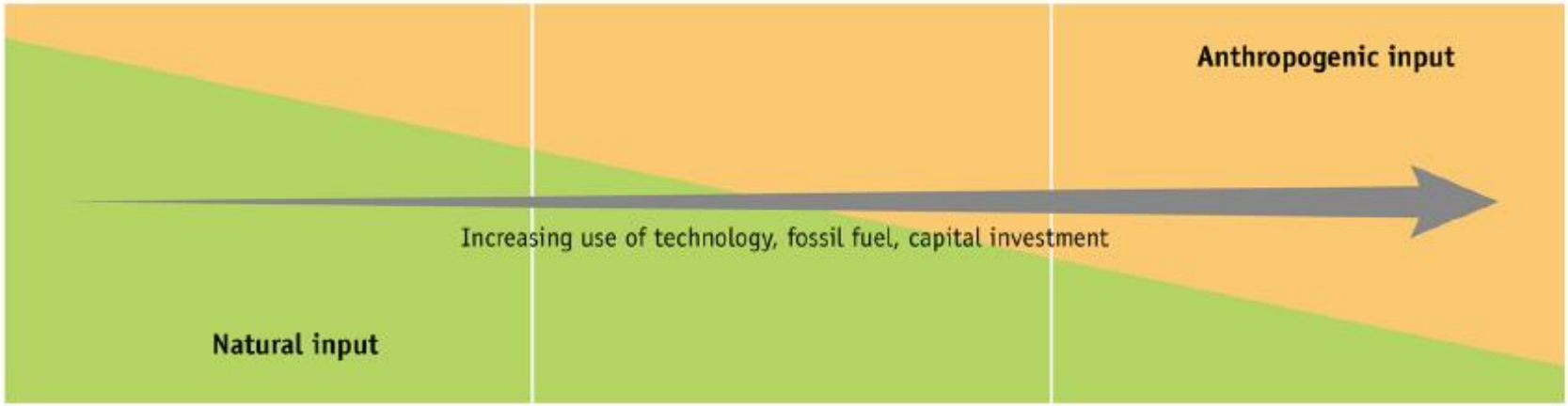

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Enhanced ecological resilience

Opportunities to benefit key drivers of forest habitat

- Increased native tree species diversity
- Better emulation of natural disturbance
- Greater provision of forest structures

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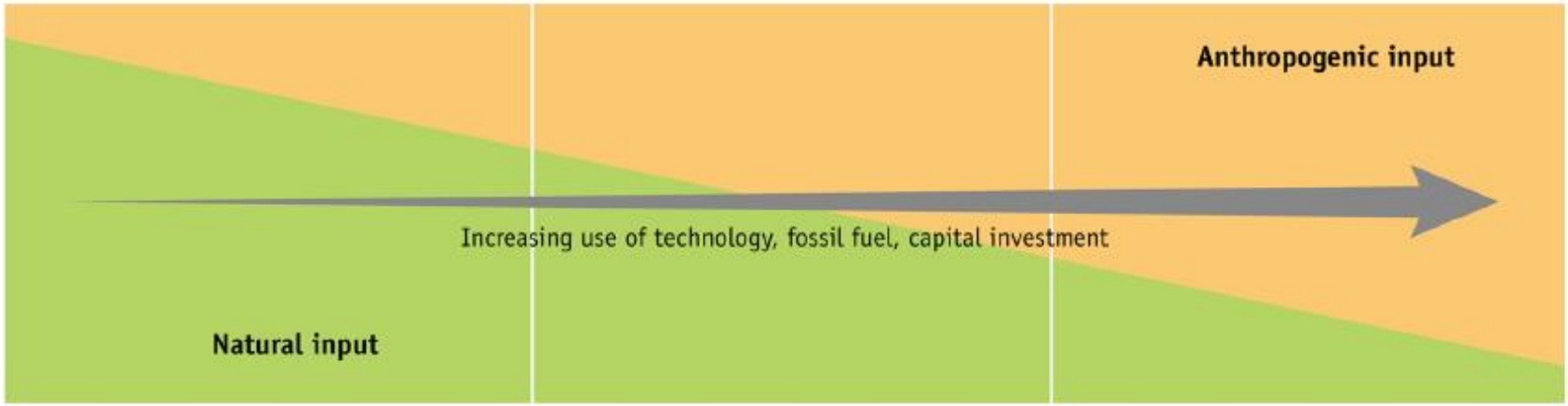

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- Greater provision of forest structures

Enhanced coerced resilience

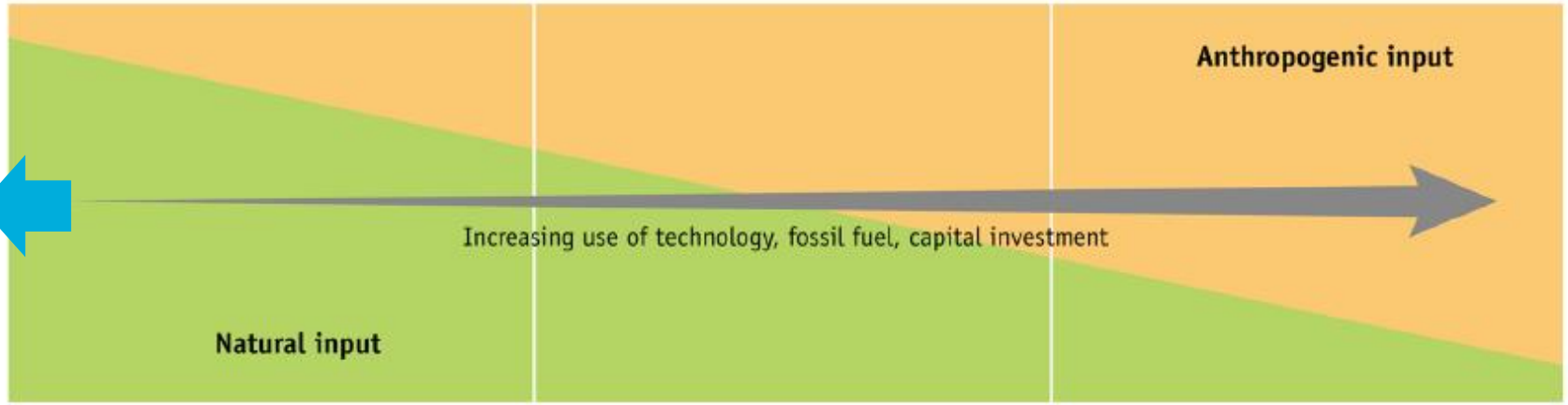
Heightened risk of combined habitat stressors

- Limited tree diversity
- Intensified disturbance cycles
- Reduced availability of key forest structures

Thereby, increased potential synergies with biodiversity

Thereby, increased potential trade-offs with biodiversity

What about over here?



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Climate change adaptation strategies involving protected areas

Five key recommendations:

1. Increase the amount of protected areas

2. Ensure sufficient connectivity

3. Protect large over small areas

4. Protect climate refugia

5. Protect areas of future importance to biodiversity

Ranius, T., et al. (In press) The consequences of climate change for biodiversity conservation strategies involving protected areas: A synthesis Ambio

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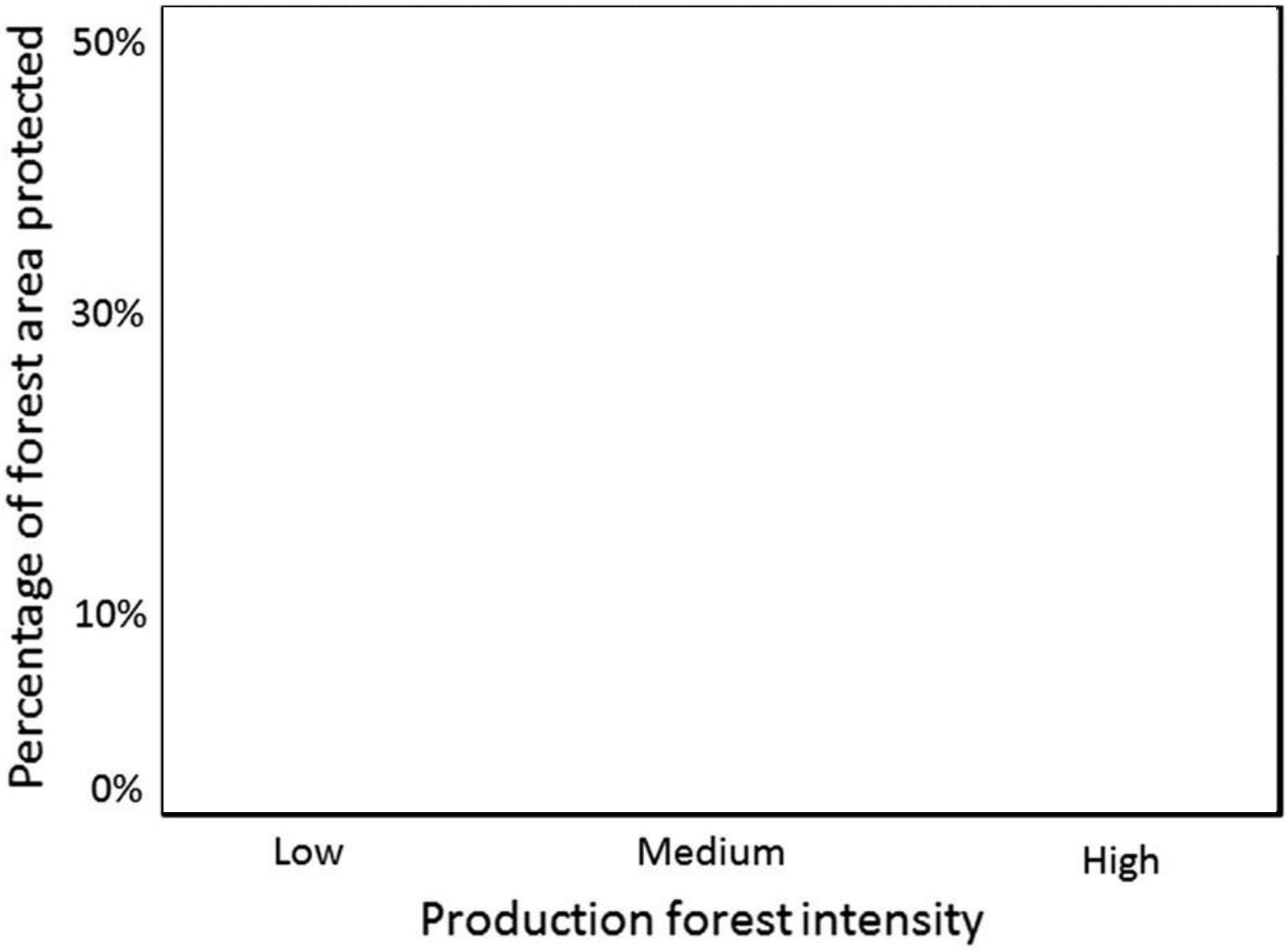

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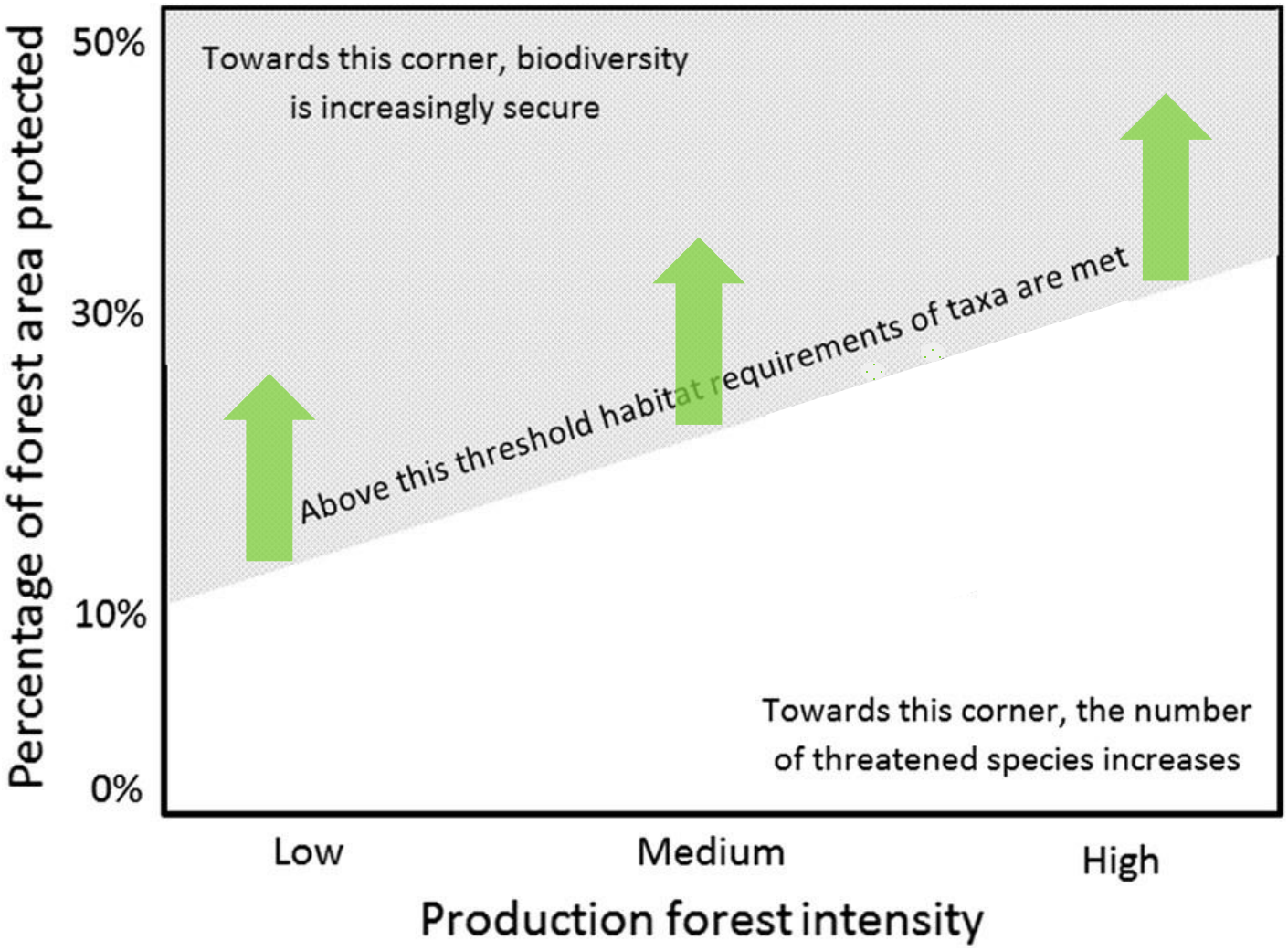

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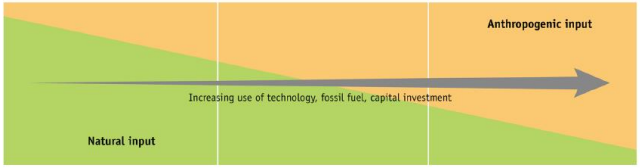
Some concluding thoughts

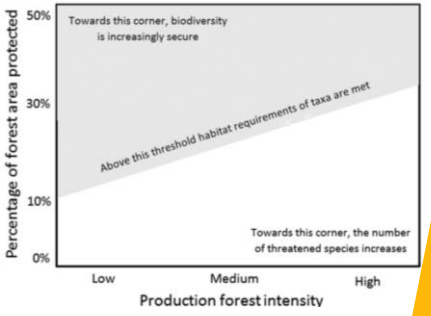
- CC adaption measures can enhance ecological or coerced resilience
  - Direct implications for forest biodiversity from our choices
  - Additional potential implications for which aspects of climate change are being adapted to

- If current reserves can't meet biodiversity needs, climate change will probably make this worse
  - Need to balance need for increased protected forest areas, intensity of production forestry, and direction of CC adaptation

- When trees unintentionally fall, we need *a priori* preparation of post-disturbance responses
  - When do we focus on limiting financial losses (e.g. salvage logging), versus using disturbances as opportunities for creating new reserves?

- Nature doesn't have foresight, but we do
  - How do we best combine this foresight with the adaptive capacity of nature to sustain forest biodiversity and ecosystem services?





Thanks for listening!

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