Capturing the benefits of responsible forestry practices in LCA: focus on biodiversity

Summary for
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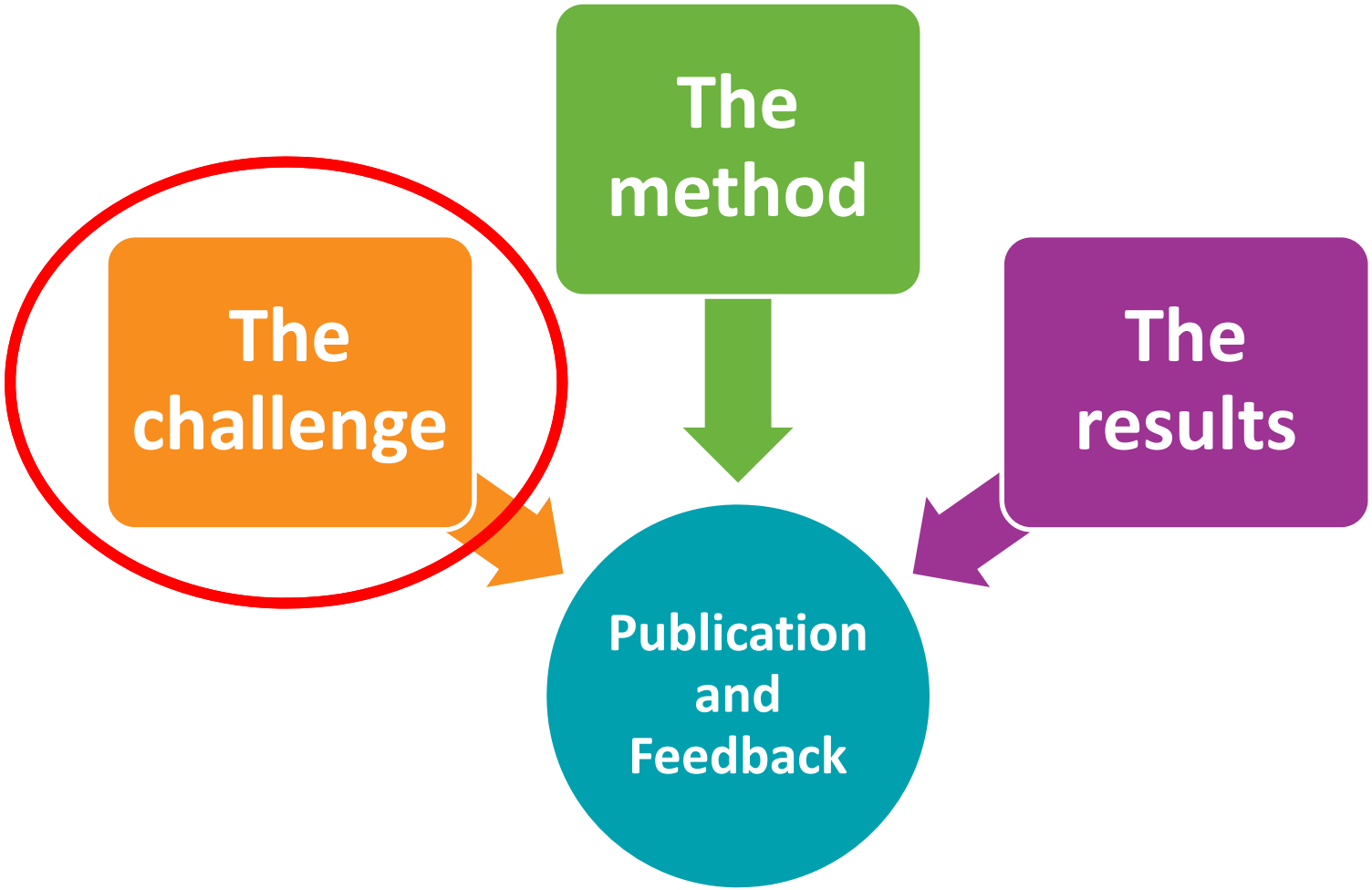
As well as: **Timo Lehesvirta, Urs Schenker, Sokhna Gueye, Robert Taylor, Oona Koski** and **Pascal Oliveira**

Agenda


The method
The challenge
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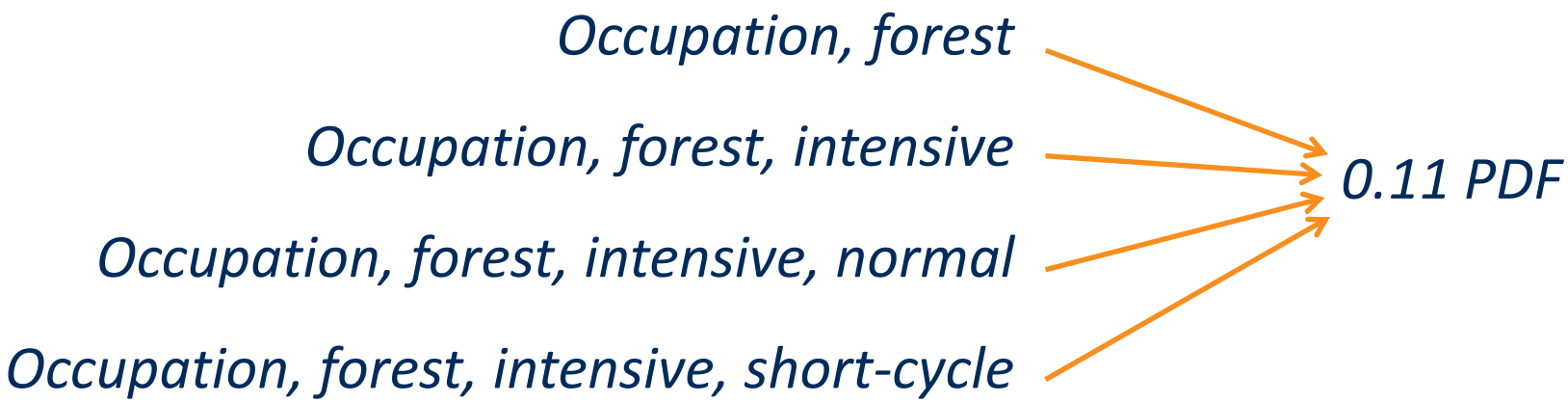
Publication and Feedback

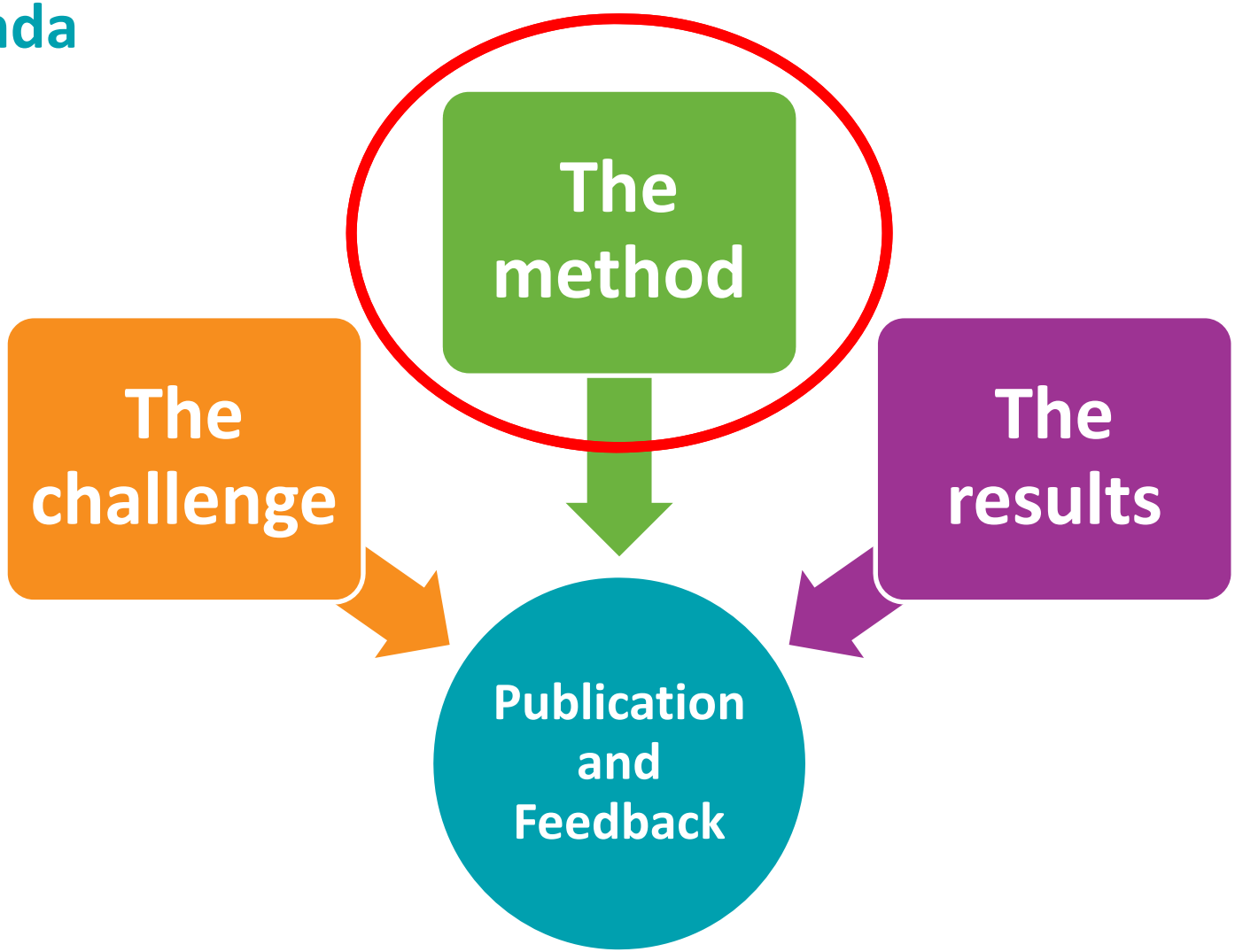
Biodiversity accounting from different forestry practices is not satisfactory in LCA



Potentially Disappeared Fraction; methods: Eco-indicator 99 and IMPACT 2002+

Need to quantify the difference between conventional and responsible forestry practices

Agenda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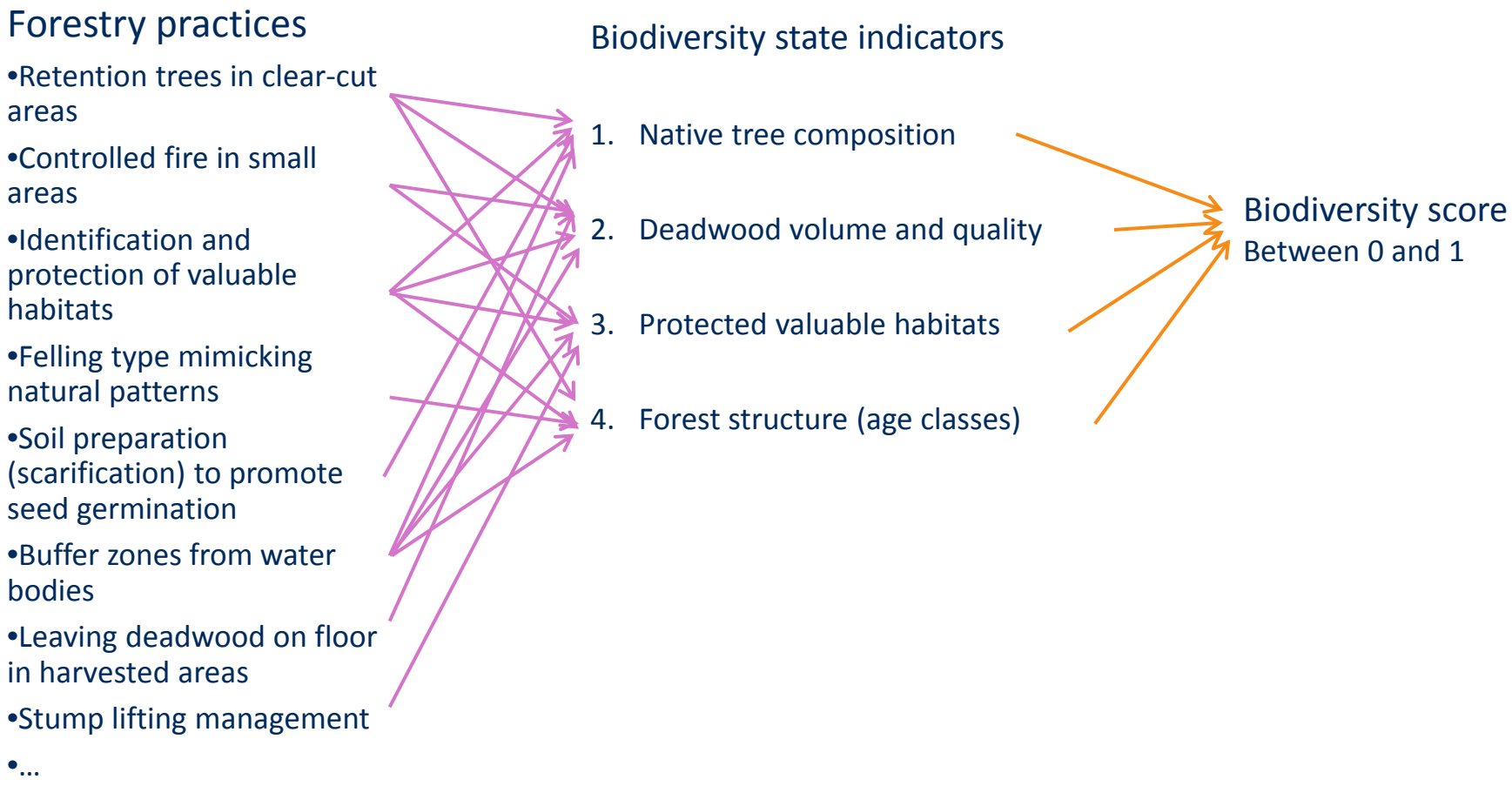
Country level
~ 200 km

Landscape level
~ 10 km

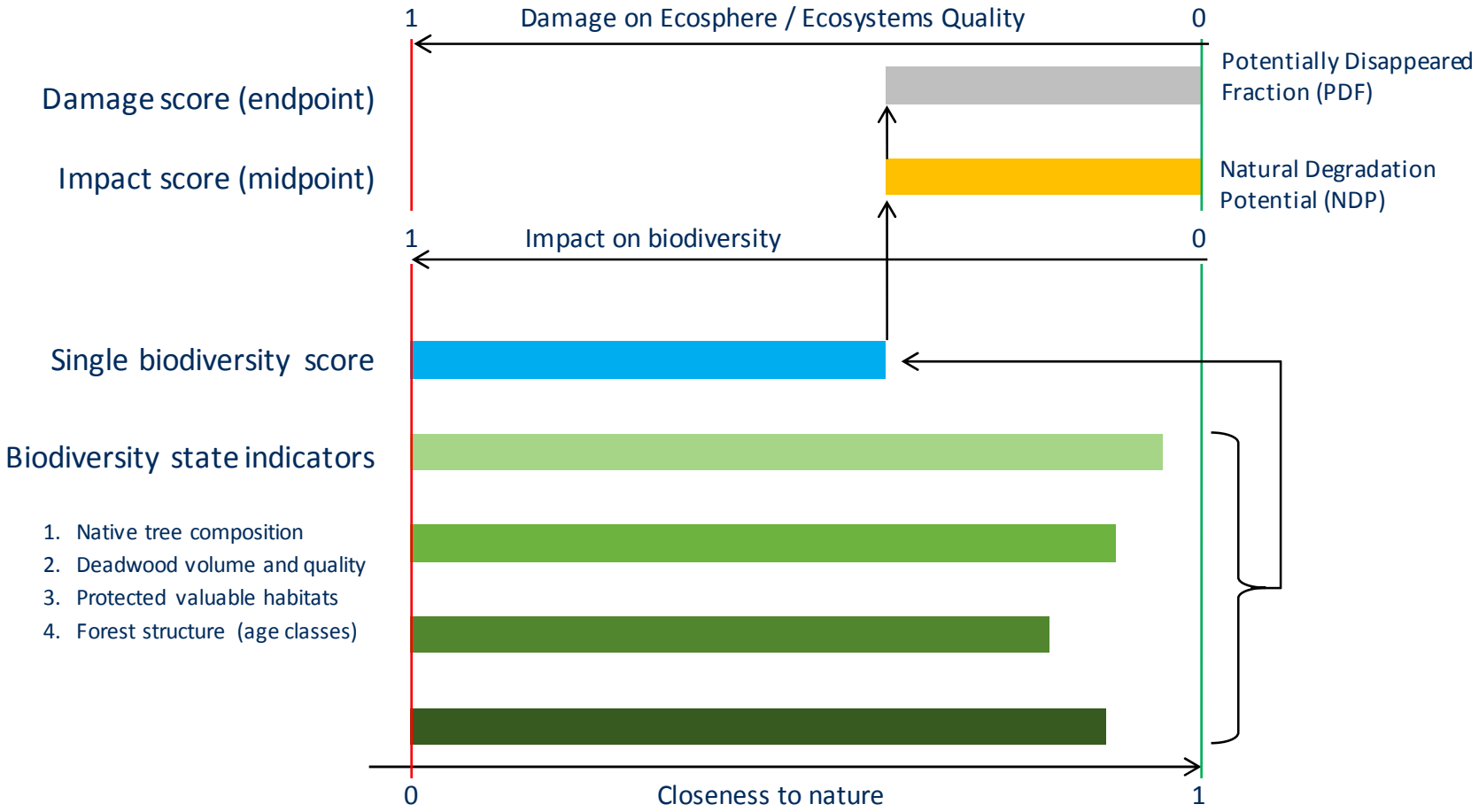
Stand level
~ 200 m

Tree level
~ 5 m

Calculation of a biodiversity score based on company's biodiversity state indicators



Simple relation between biodiversity score and Natural Degradation Potential



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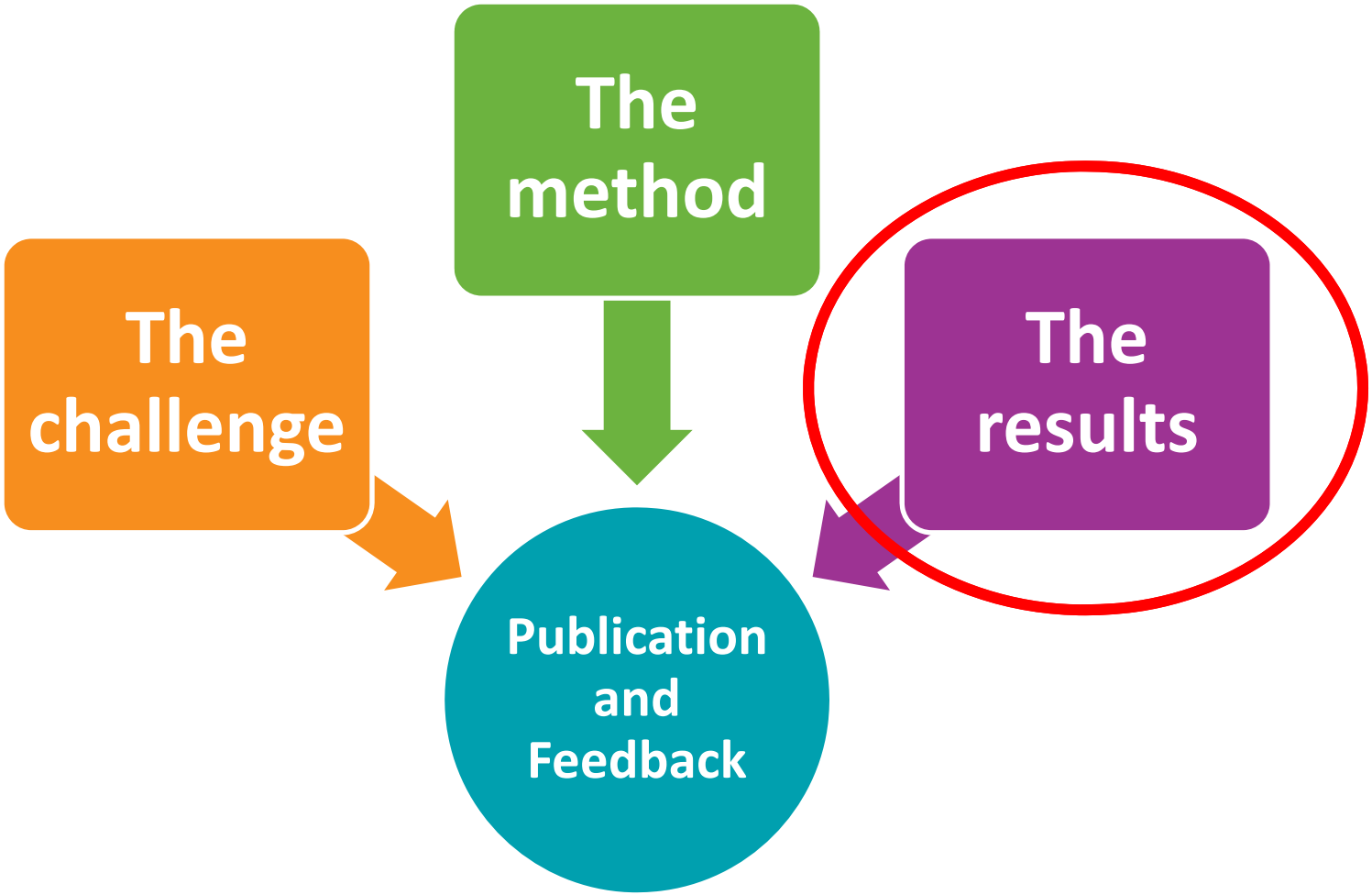
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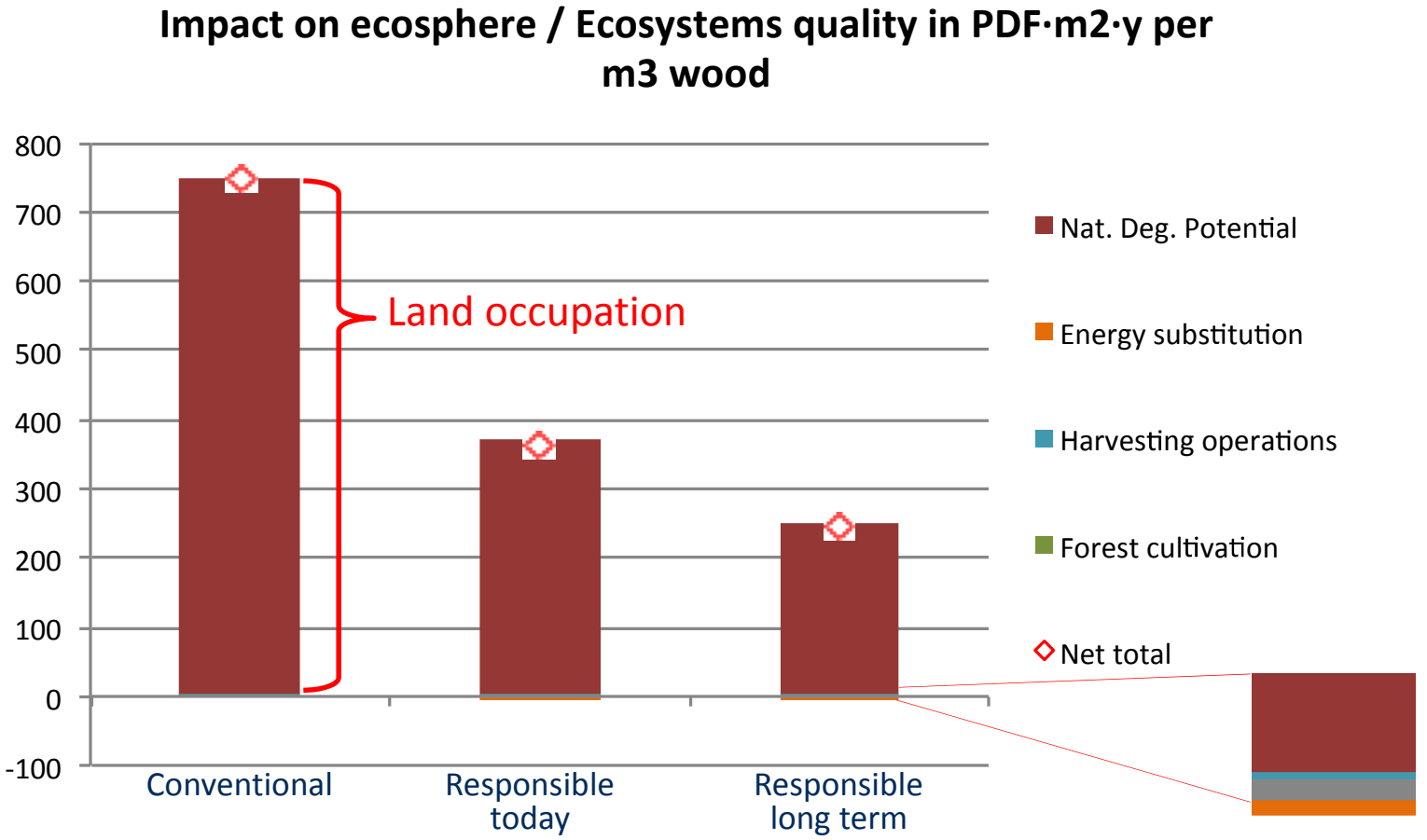
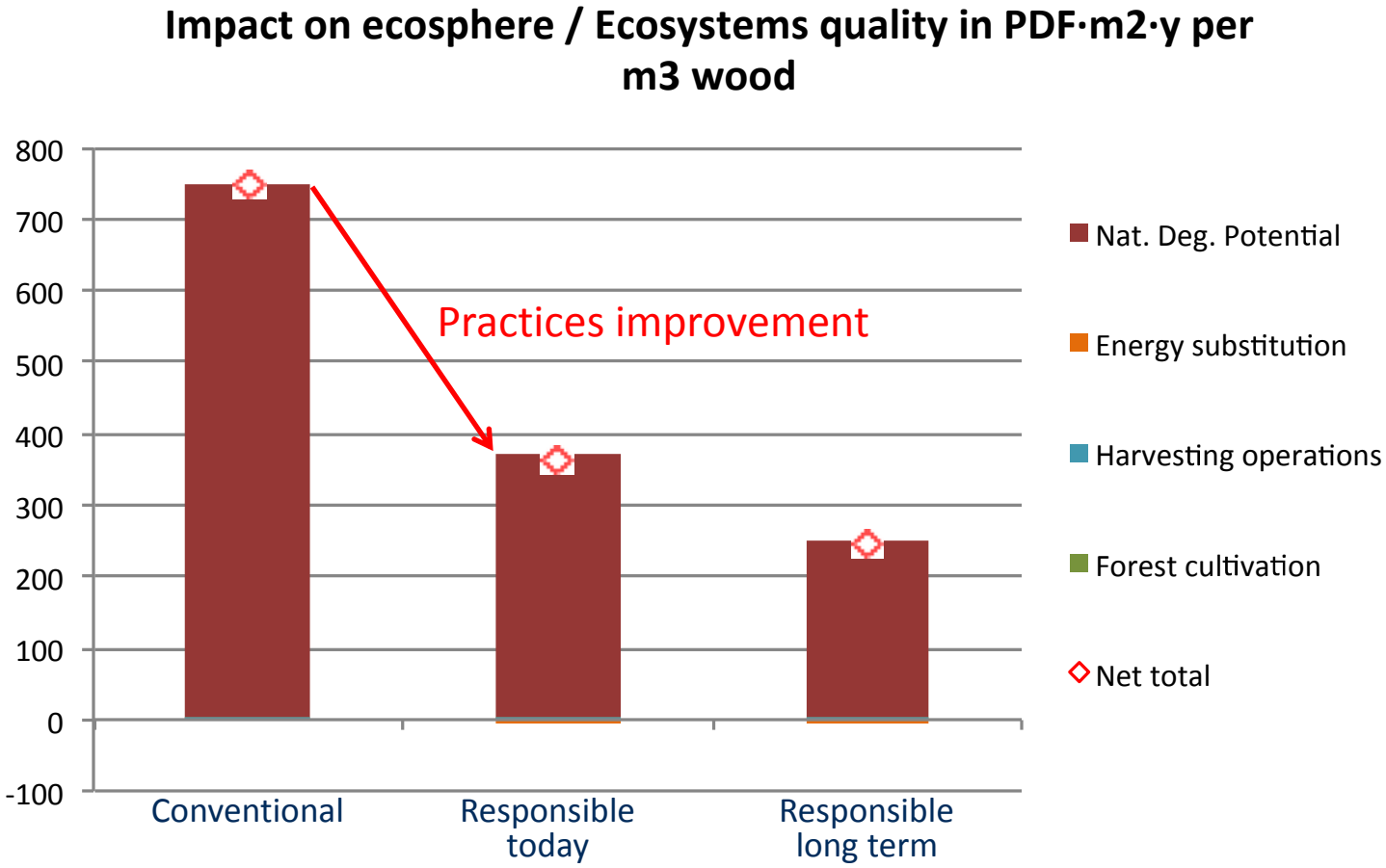
Occupation impacts dominate all other biodiversity impacts

This is not new

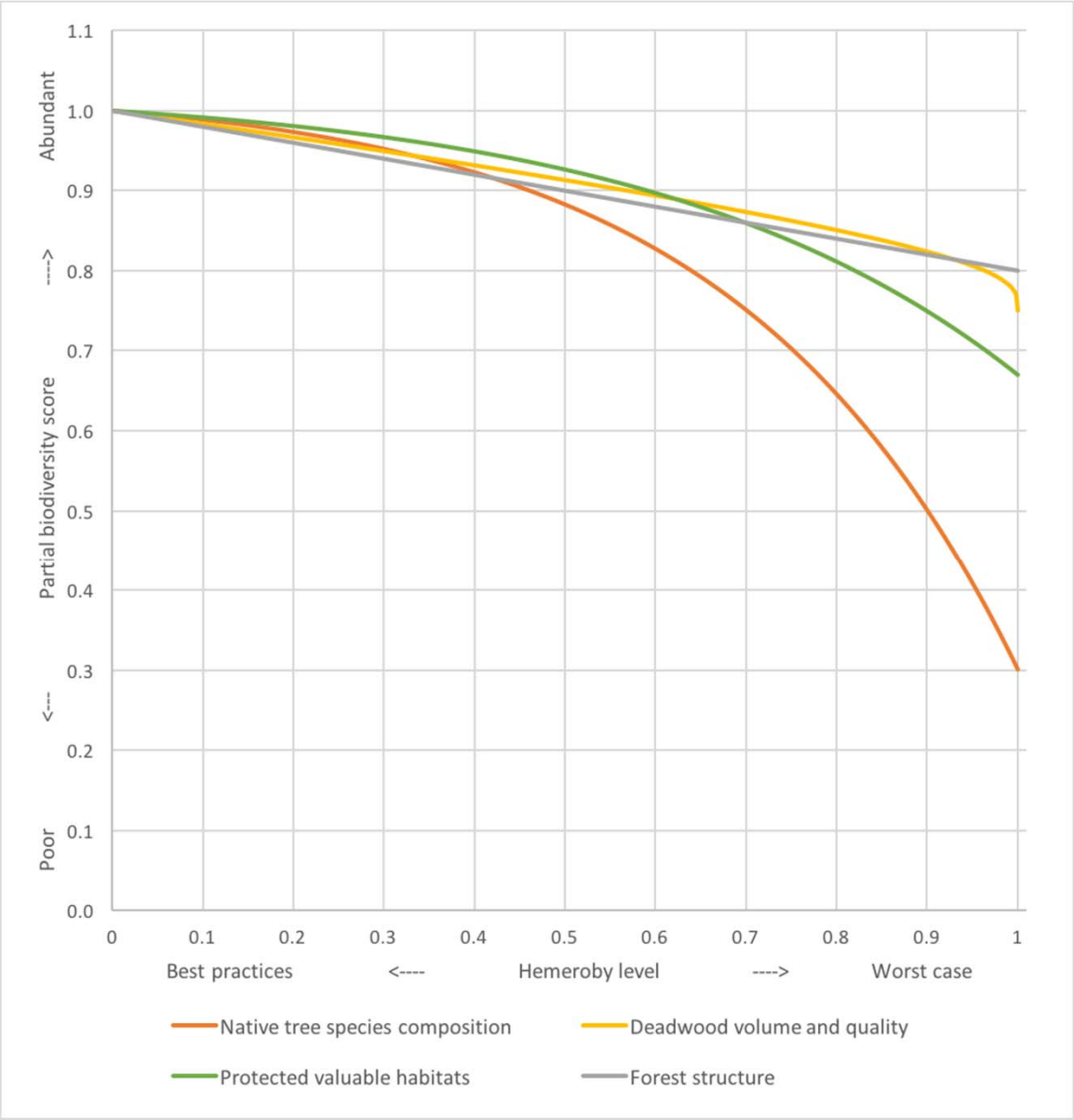


Responsible forestry practices reduce the biodiversity impacts

This is not new



Biodiversity state indicator	1990		2014		2050	
Native tree species composition	All native trees are present, and only native trees, in the natural species distribution. The umbrella is fully present. Rarest native trees are protected.	0.1	All native trees are present, and only native trees, in an almost natural species distribution (the proportion of broadleaves is a bit too small). The umbrella is fully present. Rarest native trees are protected.	0.2	All native trees are present, and only native trees, in a species distribution that is too weak for broadleaves. The umbrella is almost fully present. Rarest native trees are protected.	0.25
Deadwood volume and quality	About 90% of the stems are harvested and the naturally occurring deadwood is almost always removed. Stumps are not removed. Classes I to V are present only as relics.	0.9	About 90% of the stems are harvested but 100% of the naturally occurring deadwood and most stumps are left on floor. Classes III to V are present only as relics.	0.8	About 90% of the stems are harvested but 100% of the naturally occurring deadwood and half the stumps are left on floor. Classes I to IV are present in significant quantities and class V quantity is increasing.	0.76
Protected valuable habitats	About half of the estimated valuable habitats are identified and protected; 75% of the native species depending on valuable habitats are under protection.	0.7	About 67% of the estimated valuable habitats are identified and protected; all the native species depending on valuable habitats are under protection.	0.32	An estimated 80% of the valuable habitats are identified and protected; all the native species depending on valuable habitats are under protection.	0.2
Forest structure	The structure mimics the natural age variations at a level of 50%, full time is given to various species to colonize and live in each age class. Edges are sharp (without gradual transition).	0.4	The structure mimics the natural age variations at a level of 80%, full time is given to various species to colonize and live in each age class. Edges are sharp (without gradual transition).	0.3	The structure mimics the natural age variations at a level of 90%, full time is given to various species to colonize and live in each age class. Edges are sharp (without gradual transition).	0.2


1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Abundant
---->
Partial biodiversity score
<----
Poor
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Best practices
<----
Hemeroby level
---->
Worst case
Native tree species composition
Deadwood volume and quality
Protected valuable habitats
Forest structure

		Lowest possible score	Case study		
			Year 1990	Year 2014	Year 2050
Partial biodiversity scores	**Native tree species composition**	0.3	0.99	0.97	0.96
	Deadwood volume and quality	0.75	0.82	0.85	0.86
	Protected valuable habitats	0.67	0.86	0.96	0.98
	Forest structure	0.8	0.92	0.94	0.96
	BP	**0.12**	**0.64**	**0.75**	**0.78**
	NDP	0.88	0.36	0.25	0.22
	PDF	0.88	0.36	0.25	0.22
	Occupation damage factor PDF×m2×a/(m²×a)	0.88	0.36	0.25	0.22
	Wood yield m³/(ha× a)		4.2	4.9	4.8
	Damage score PDF×m²×a/m³ wood		**847**	**510**	**458**

The advantages of responsible forestry practices can now be *quantified* and *used* in LCAs with a practical method

Occupation, forest, responsible case A → *0.15 PDF*

Occupation, forest, responsible case B → *0.12 PDF*

Occupation, forest, conventional case C → *0.27 PDF*

Peer-reviewed study
Article submitted

- Scope limited to semi-natural forestry
- Adapted for plantations, but needs refinement
- Does not allow comparison between biomes (yet)

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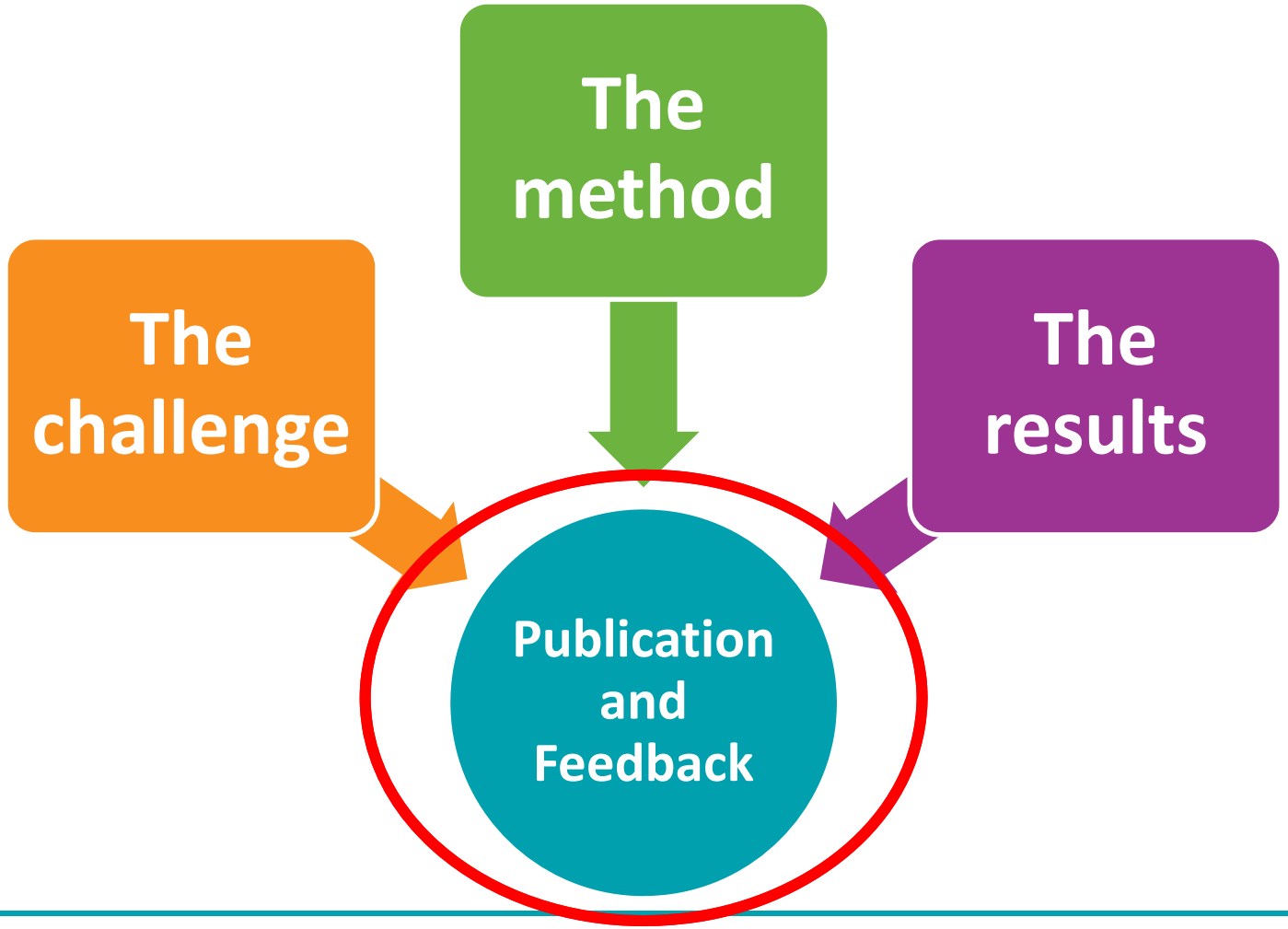
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Feel free to contact us would you need to know more

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Supplementary information

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1) Native tree species composition

Native trees carry their biodiversity umbrella (life habitat at each stratum)

Adapted to local conditions, local trophic chain

Rare trees are protected and promoted

2) Deadwood volume and quality

Naturally occurring dead trees are left on ground

All classes, from newest (hard) to oldest (soft and colonized), are present

3) Protected valuable habitats

All valuable habitats are identified, inventoried and protected

100% of the identified native species are protected

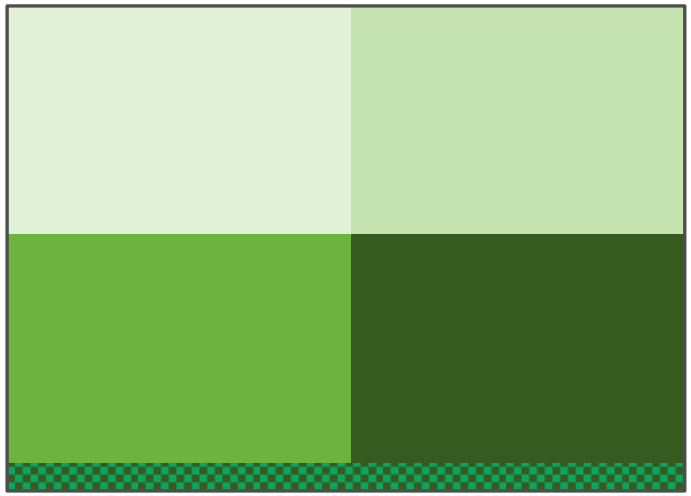
4) Forest structure

How to design felling practices to promote biodiversity?

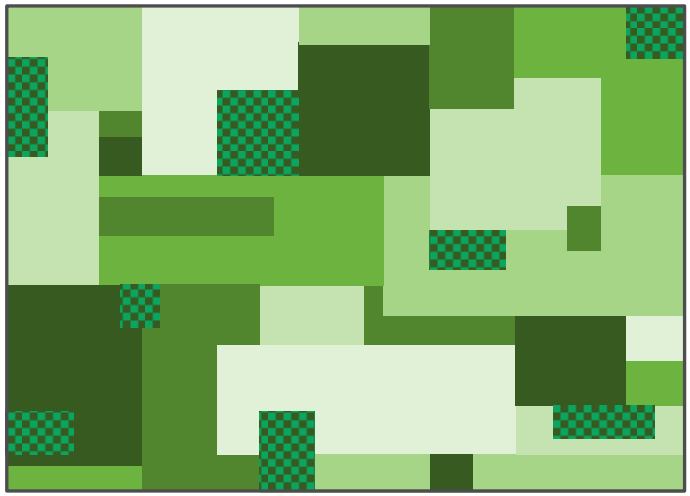
Mimic pattern/structure from natural events

Age class: young old protected

Bad practice:



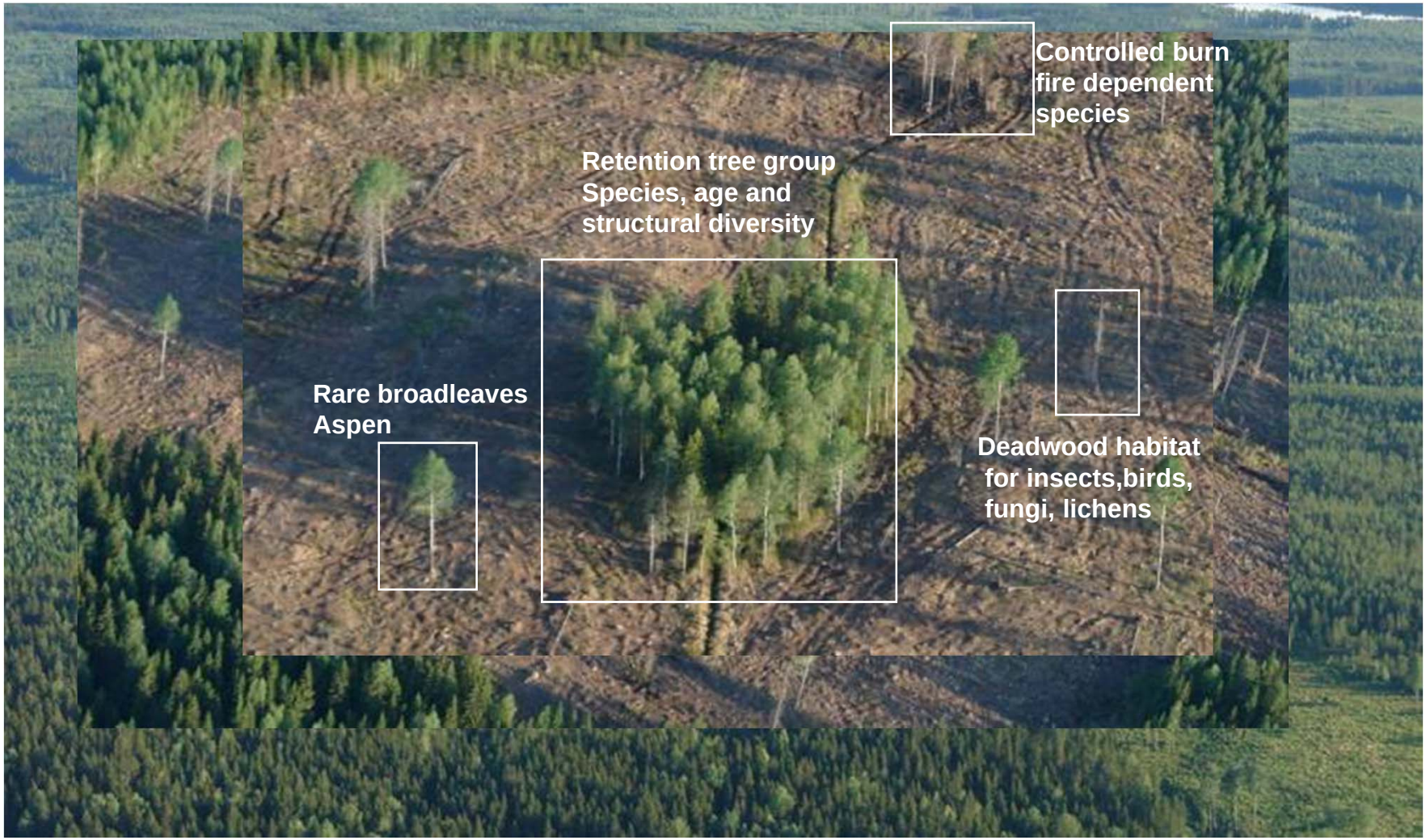
Good practice (mimicking natural random pattern)



Typical scale: 3 km x 2 km (landscape level)

In practice – example in Finland

In practice – example in Finland



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