



Adaptation of forest biomass monitoring and reporting in Austria according to the requirements of the EU LULUCF Regulation

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OUTLINE

- Monitoring and reporting requirements for forest biomass under the EU LULUCF Regulation
- Data sources for estimating forest biomass changes in Austria
- Preparing annual biomass estimates based on indices
- Conclusions for Austria

MONITORING AND REPORTING REQUIREMENTS UNDER THE EU LULUCF REGULATION

- GHG inventories with annual emissions/removals (same as under UNFCCC)
- LULUCF sector has to meet EU-wide GHG targets (2021-2025 / 2026-2030)
- Managed Forest land results accounted vs. Forest Reference Level (2021–2025)
- Total LULUCF results accounted vs. LULUCF budget for 2026-2029 and LULUCF target 2030 (2026-2030)

- Years which determine the baselines for the accounting period 2026-2030:
 - 2021-2023 and 2016-2018 for the LULUCF trajectory/budget 2026-2029
 - 2016-2018 for the LULUCF target 2030

MONITORING AND REPORTING REQUIREMENTS UNDER THE EU LULUCF REGULATION

- Important submissions for accounting:
 - ✓ Submission 2020 for the Member States' target 2030
 - ✓ Submission 2025 for the LULUCF budget 2026-2029
 - ✓ Submission 2027 for the final accounts of period 2021-2025
 - ✓ Submission 2032 for the final accounts of period 2026-2030 (and for the average 2016-2018 to calculate the final 2030 target)
- For these submissions we need **results** which are as **accurate and representative as possible** for the relevant years

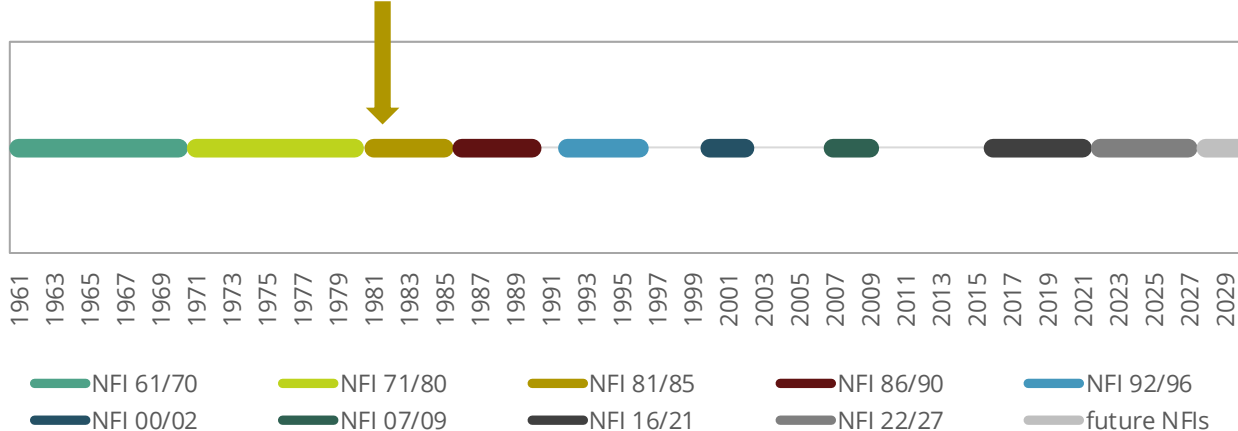
Challenges:

- Monitoring systems like NFIs take usual several years until providing data for the monitored (historic) period
- Time gaps between NFIs may exist, which prolongue the time span of providing accurate and representative figures
- NFIs assess average annual stemwood increments and drains, but not specific results for years
- But we know: the **actual** results for specific years vary a lot (e.g. due to weather conditions which influence biomass increment, wood prices and natural disturbances which influence the biomass drain)

DATA SOURCES FOR ESTIMATING FOREST BIOMASS AND DEAD WOOD CHANGES IN AUSTRIA

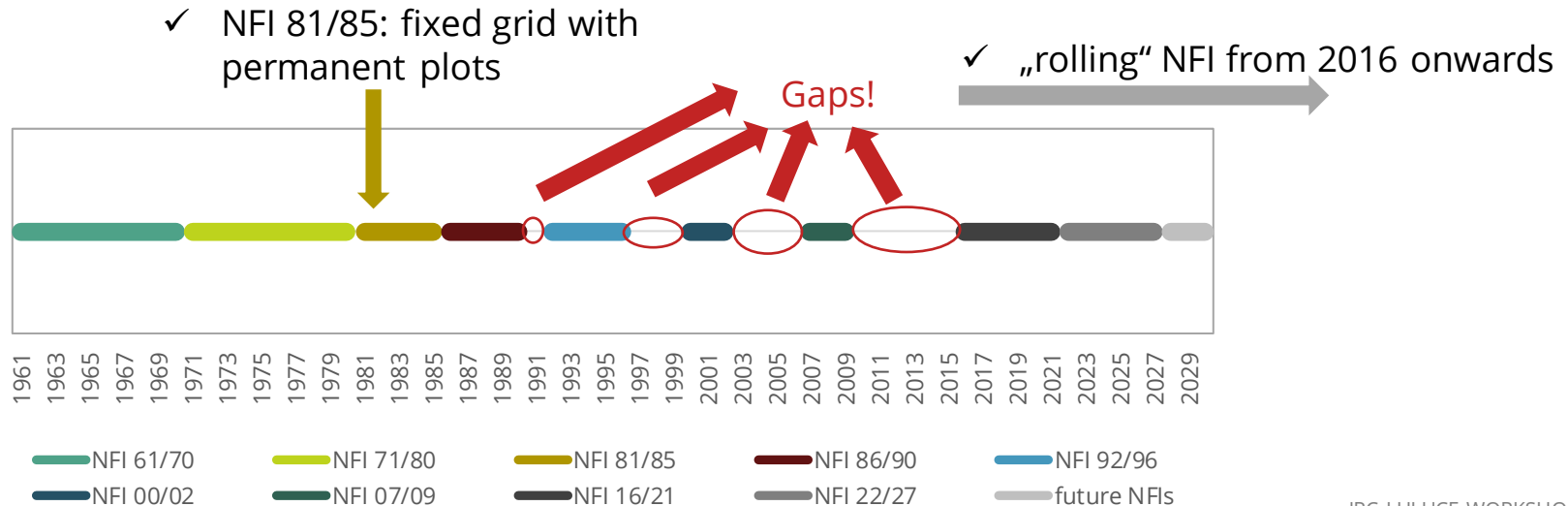
- National Forest Inventory by the *Austrian Research Centre for Forests (BFW)*:
<https://www.waldinventur.at/#/ENG>
- NFI monitoring periods in Austria:

✓ NFI 81/85: fixed grid with permanent plots



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DATA SOURCES FOR ESTIMATING FOREST BIOMASS CHANGES IN AUSTRIA

Selected relevant features of Austrian NFI for forest biomass monitoring:

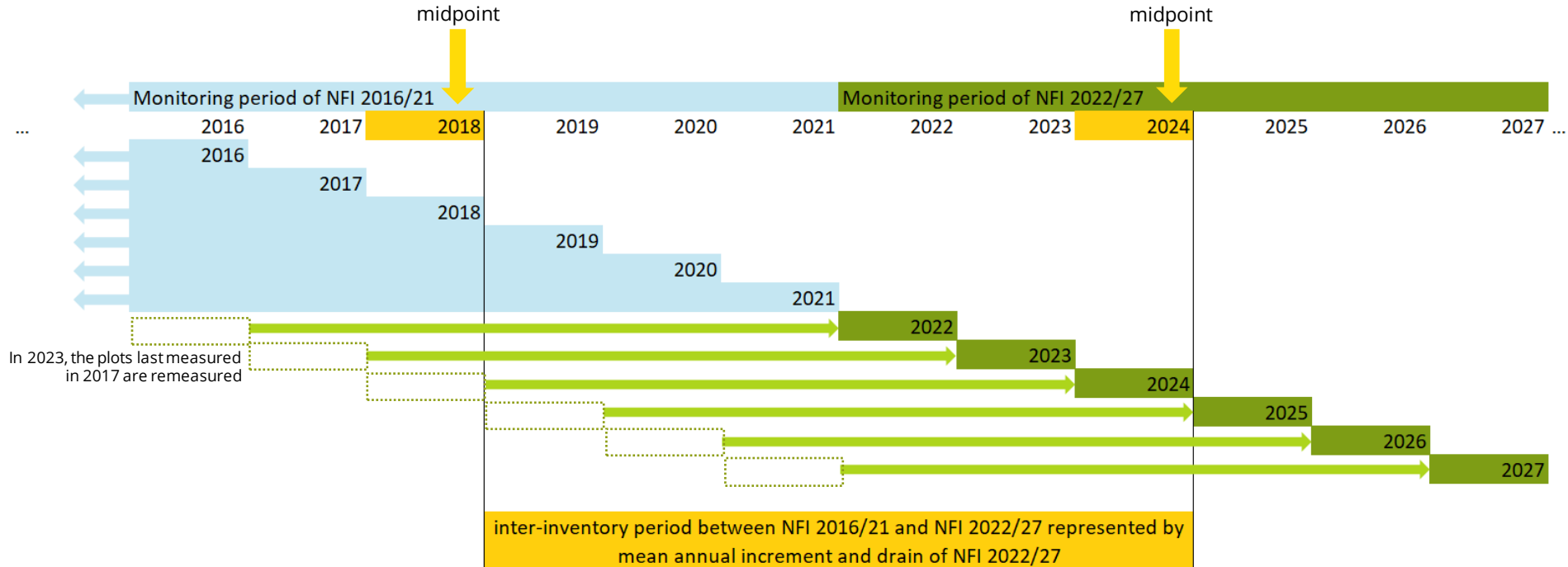
- 4 x 4 km country-wide grid net with four permanent sample plots of 300 m² size at each grid point
- Same trees are remeasured, which ensures accurate assessment of tree increment and drain for GHG gain/loss method
- Gaps between NFI monitoring periods increased in the past – high-level intervention supported a change to a rolling NFI system without monitoring gaps since NFI 2016/21
- Every year 1/6 of all NFI grid points is remeasured (i.e. equally distributed across Austria => representative)
- ✓ Austria will use preliminary NFI results to estimate increment and drain, which are as representative and as accurate as possible for the reported years and for the relevant submissions 2025, 2027 and 2032

ESTIMATING ANNUAL RESULTS USING INDICES

- NFI provides mean annual increment / drain between individual NFI periods
- NFI results 2022/27 for mean annual biomass increment / drain are based on monitored 6-year-changes across full period 2016 to 2027
- Therefore, we pragmatically allocate the mean annual increment / drain of an NFI to the „inter-inventory“ period
- Each “inter-inventory” period spans the midpoint of one NFI to the midpoint of the next NFI
 - e.g.: the „inter-inventory“ period between NFI 2016/21 and NFI 2022/27 are defined as the years 2019 to 2024

ESTIMATING ANNUAL RESULTS USING ANNUAL INDICES

NFI monitoring period and inter-inventory period



ESTIMATING ANNUAL RESULTS USING INDICES

- Instead of using the same average annual increment and drain for the inter-NFI periods, **relative indices** are used to distribute drain and increment across single years
 - Relative indices for increment: annual representative tree ring cores from >1000 trees sampled in the NFI
 - Relative indices for drain: annual timber harvest statistics (Holzeinschlagsmeldung¹)
- Equation (example for increment): $G_t = G_{pt} * (In_t / In_{pt})$

G_t ... Biomass increment for year t

G_{pt} ... mean annual biomass increment of the inter-NFI period in question

In_t ... annual increment index in year t

In_{pt} ... mean of annual increment indices for the inter-NFI period in question

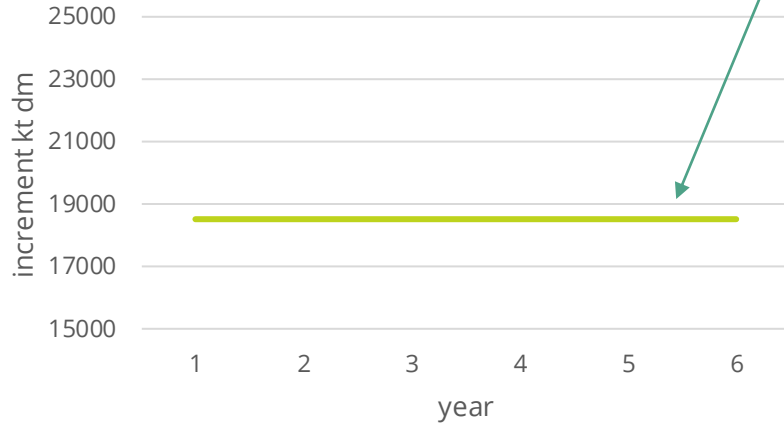
- Method ensures consistency between the mean for an inter-NFI period and the NFI-result

(Method and comparison with other approaches published in: *Heikkinen et al.* 2012; <http://dx.doi.org/10.5849/forsci.10-086>)

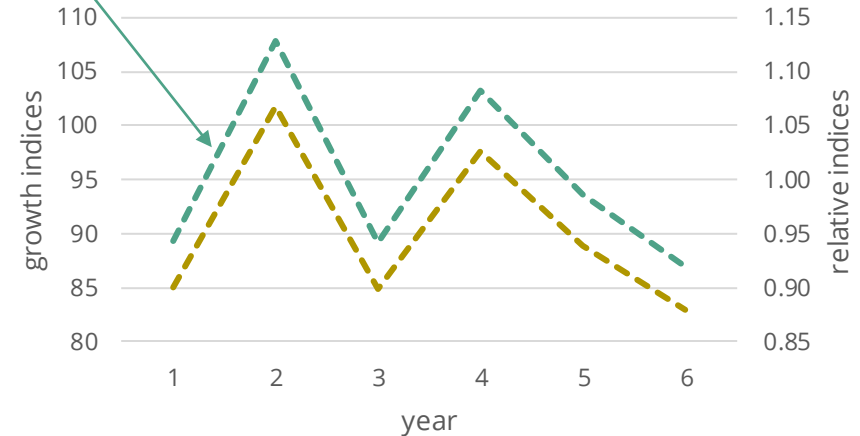
¹Timber harvest statistics: <https://info.bml.gv.at/themen/wald/wald-in-oesterreich/wald-und-zahlen/Holzeinschlag.html>

CONVERSION OF MEAN INTER-NFI INCREMENT TO ANNUAL INCREMENT

$$G_t = G_{Pt} * (I_n_t / I_n_{Pt})$$



— mean annual total tree increment according to NFI (G_{Pt})

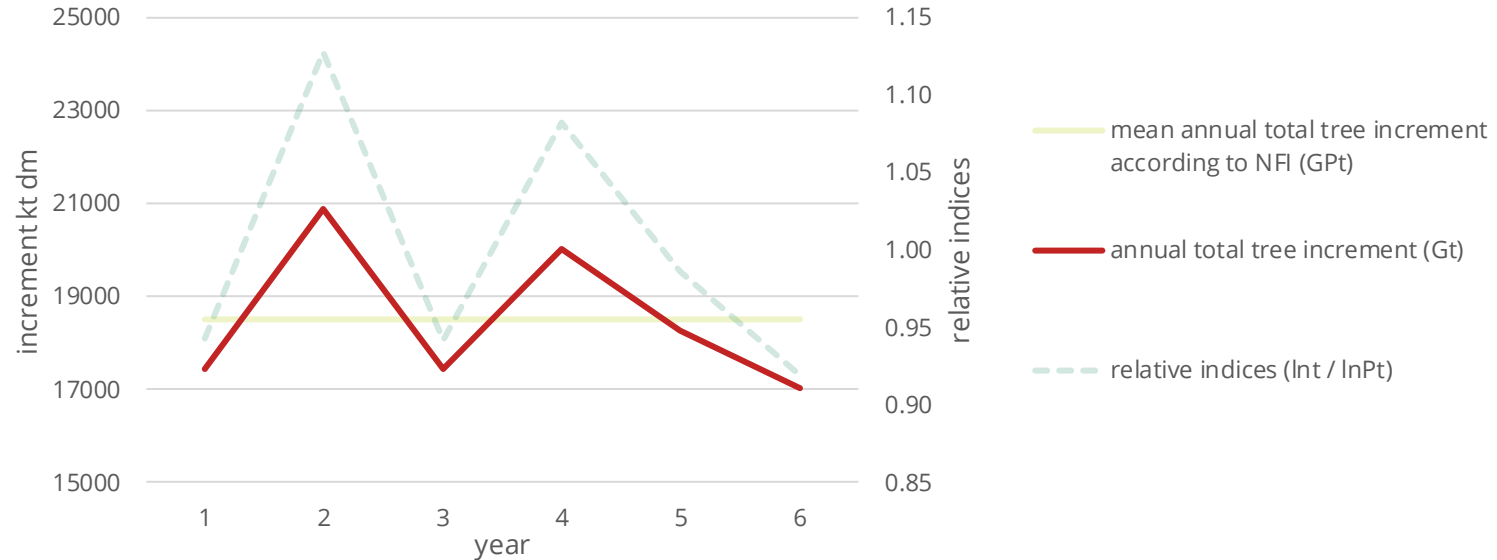


— growth indices (I_{n_t})

— relative indices (I_{n_t} / I_{n_{Pt}})

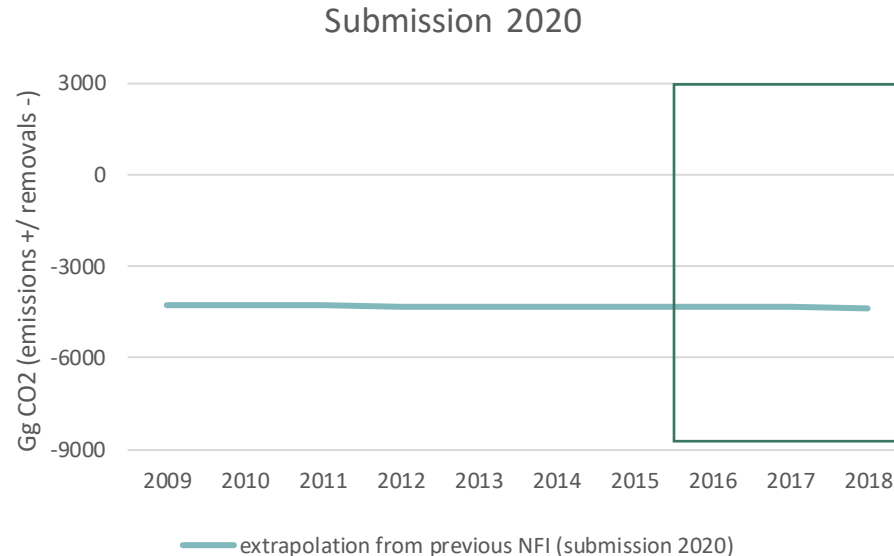
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MEAN NET REMOVALS/EMISSIONS 2009 TO 2018 FOR BIOMASS OF FL REM FL

- Different means for the period 2016 to 2018 depending on accuracy and currentness of data

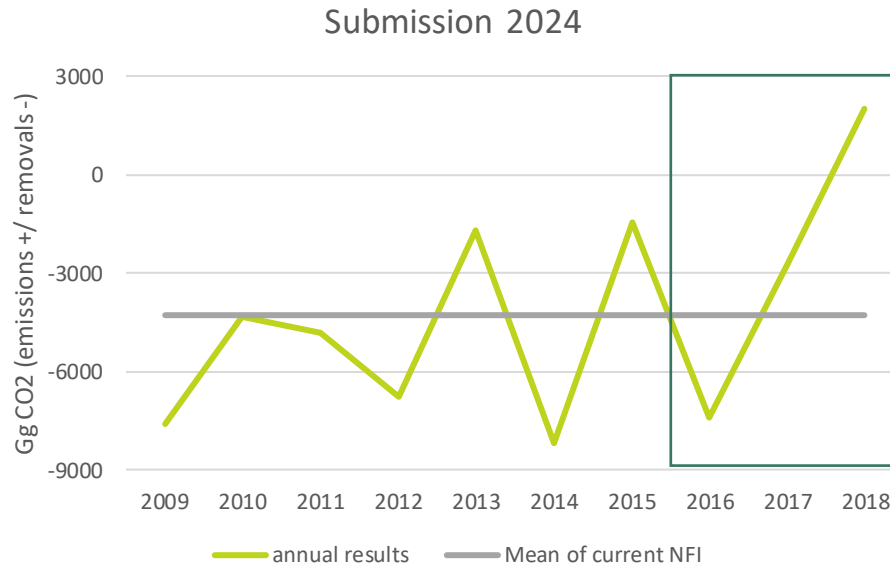


Mean of period 2016-2018 with NFI 07/09:

- -4 355 Gg CO₂

MEAN NET REMOVALS/EMISSIONS 2009 TO 2018 FOR BIOMASS OF FL REM FL

- Different means for the period 2016 to 2018 depending on accuracy and currentness of data



Mean 2016-2018 in current submission:

- Mean of annual results: -2 686 Gg CO₂
- Mean of NFI: -4 287 Gg CO₂

CONCLUSIONS

- GHG reporting and accounting requires annual results: in Austria we start with frequent analyses of (preliminary) NFI data
- The use of relative increment indices and harvest indices allows to convert annual means of biomass increment and drain from NFIs into accurate annual results
- The specific annual net results vary to a large extent depending on weather conditions, harvest rates and natural disturbances
- It is important that the the used input data is accurate, representative and up to date to determine the baselines for accounting (e.g. 2016 to 2018, 2021 to 2023)
- The defined length and years of the baseline and accounting period are very sensitive for the result

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