



© Carmen Schmid

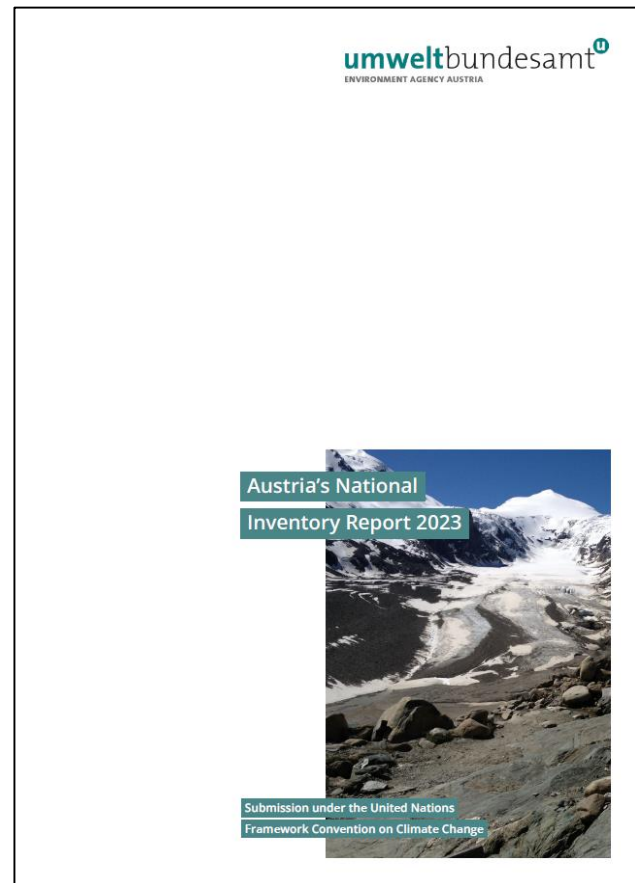
Use of Remote Sensing for Timely LULUCF Inventories: Perspectives for Austria

Bradley Matthews, Carmen Schmid, Erwin Moldaschl, Merlin Mayer, Bettina Schwarzl, Elisabeth Schwaiger, Andreas Bartel, Martin Neuwirth, Michael Weiss, Gebhard Banko and Peter Weiss

JRC LULUCF WORKSHOP 2023, ISPRA 11-12 MAY 2023

Context and overview

- Need for *timely* LULUCF inventories is increasing
- Remote sensing (RS) could contribute on this front and could provide data that help fulfill the reporting requirements of the (revised) EU LULUCF Regulation
- Ongoing and planned work to include RS and non-RS data in the Austrian LULUCF inventory
 - Work with LULUC data from *inter alia* airborne RS
 - Investigating the utility of LULUC data from satellite RS
 - Rolling NFI



© Umweltbundesamt

Current Inventory Methods – LU and LUC areas to Settlements

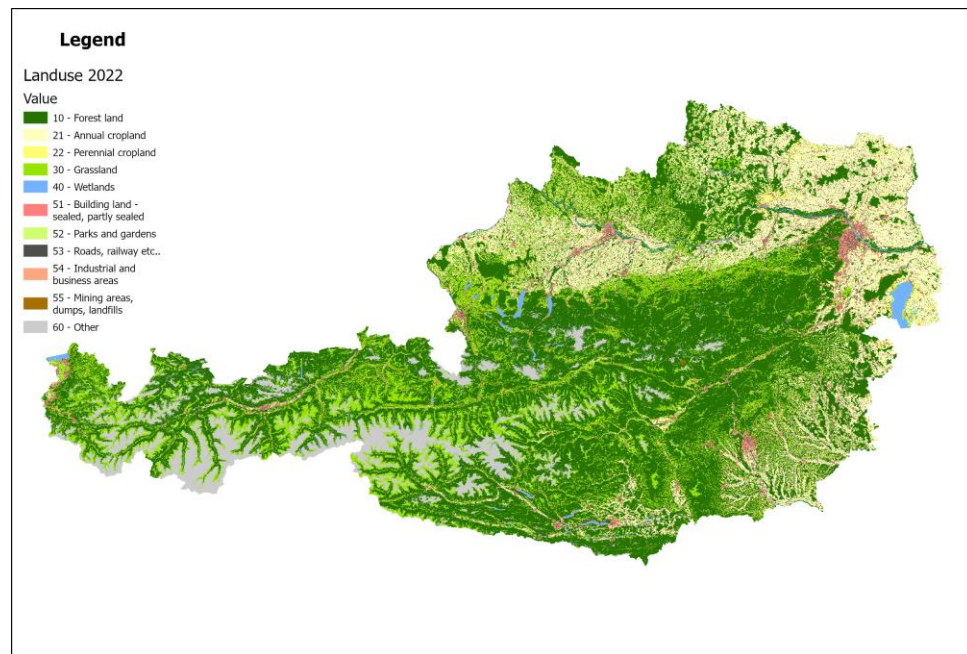
TO:	Forest land (managed)	Forest land (unmanaged)	Cropland	Grassland (managed)	Grassland (unmanaged)	Wetlands (managed)	Wetlands (unmanaged)	Settlements	Other land	Total unmanaged land	Initial area
FROM:	(kha)										
Forest land (managed) ⁽²⁾								0,49	1,13	NO	4017,28
Forest land (unmanaged) ⁽²⁾								NO	NO	NO	NO
Cropland ⁽²⁾								1,10	NO	NO	1391,83
Grassland (managed) ⁽²⁾								0,01	NO	NO	1512,11
Grassland (unmanaged) ⁽²⁾								NO	NO	NO	NO
Wetlands (managed) ⁽²⁾								NO	NO	NO	153,99
Wetlands (unmanaged) ⁽²⁾								NO	NO	NO	NO
Settlements ⁽²⁾								578,89	NO	NO	579,34
Other land ⁽²⁾								NO	730,48	NO	732,44
Total unmanaged land ⁽³⁾								NO	NO	NO	NO
Final area								580,49	731,60	NO	8387,00
Net change⁽⁴⁾								1,14	-0,84	NO	0,00

Mixed Approach:

- National statistics on total Settlement
- NFI for Forest land to Settlements
- Residual increase in Settlement area (after accounting for FL → S) filled with residuals from the Cropland and Grassland area balances

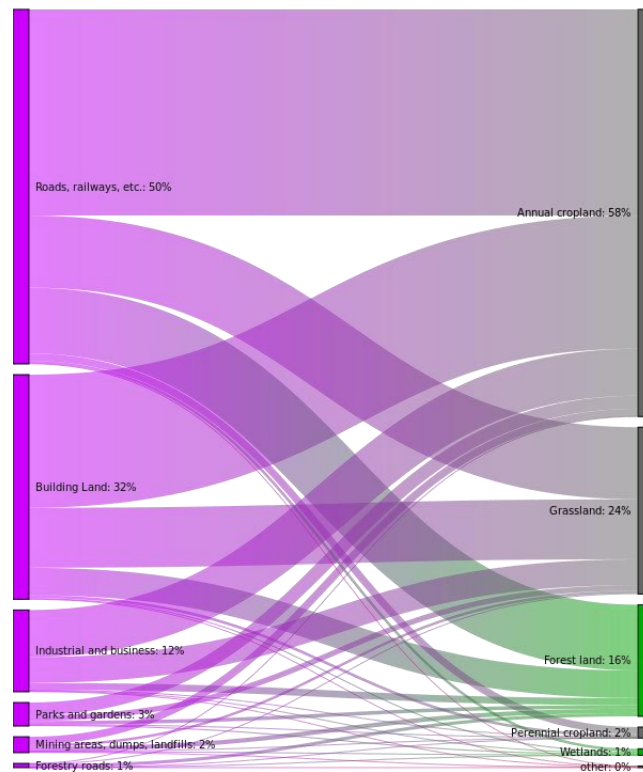
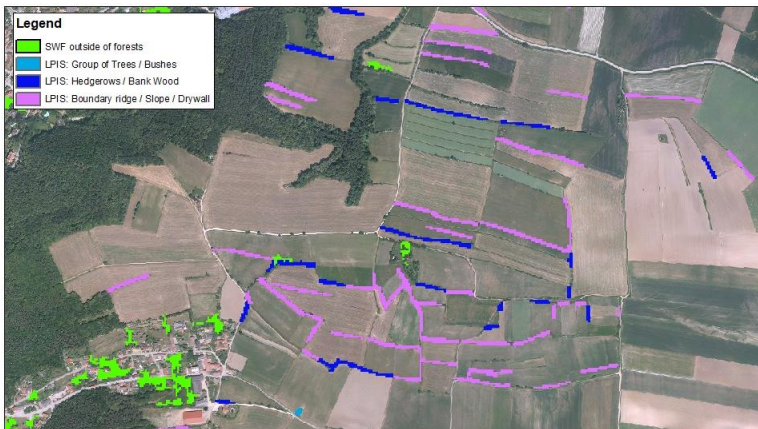
Improving monitoring of LUC to Settlements

- Use of national, spatially-explicit datasets
e.g.:
 - *Digitale Katastralmappe (DKM)* - Settlements
 - *Invekos* – Cropland and Grassland
 - *Waldlayer* – Forest land
 - *LISA light* (Bare Rock)
- Land-use changes 2016/2020 and 2020/2022
 - Focus on LUCs to Settlement from Cropland and Grassland
- Ongoing:
 - Comparison of LU and LUCs with other datasets
 - Backcasting to 1970 → **Mixed approach!**



Investigating added-value of satellite-based remote sensing: CLMS

- Work with the ETC-ULS and ETC-DI
 - CORINE land cover (CLC)
 - CLC+
 - High resolution layers (HRLs)
 - LULUCF Instance



Investigating added-value of satellite-based remote sensing: Sentinel data

Co-development of the FFG ASAP 18 Call

- 18th call of the FFG Austrian Space Applications Program (ASAP) - Integrated Greenhouse Gas Monitoring in Austria with Copernicus
- Aim - Flagship project to deliver methods and prototypes for utilising current and emerging Copernicus data to support national emissions monitoring

Stakeholder support to the *GHG-Kit* project

- Development of a prototype support system for integrated Greenhouse gas accounting and monitoring based on satellite information products
 - System for deriving LULUCF activity data time series for Austria from EO data
 - Inverse modelling system for verification of the currently reported emissions (top-down approach)

The poster features a satellite in orbit over Earth's horizon. At the top left is the logo of the Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie. At the top right is the FFG logo with the tagline 'Forschung wirkt.'. Below the FFG logo is the 'Austria in Space' logo with the URL 'austria-in-space.at'. A white box at the bottom left contains the following text: '18. AUSSCHREIBUNG', 'ENREICHFRIST: 01. DEZEMBER 2021, 12:00 UHR', 'LEITPROJEKT ENREICHFRIST: 25. JÄNNER 2022, 12:00 UHR', 'WIEN, SEPTEMBER 2021', and 'ASAP AUSSCHREIBUNGSLEITFADEN'.

Bundesministerium
Klimaschutz, Umwelt,
Energie, Mobilität,
Innovation und Technologie

FFG
Forschung wirkt.

Austria in Space
austria-in-space.at

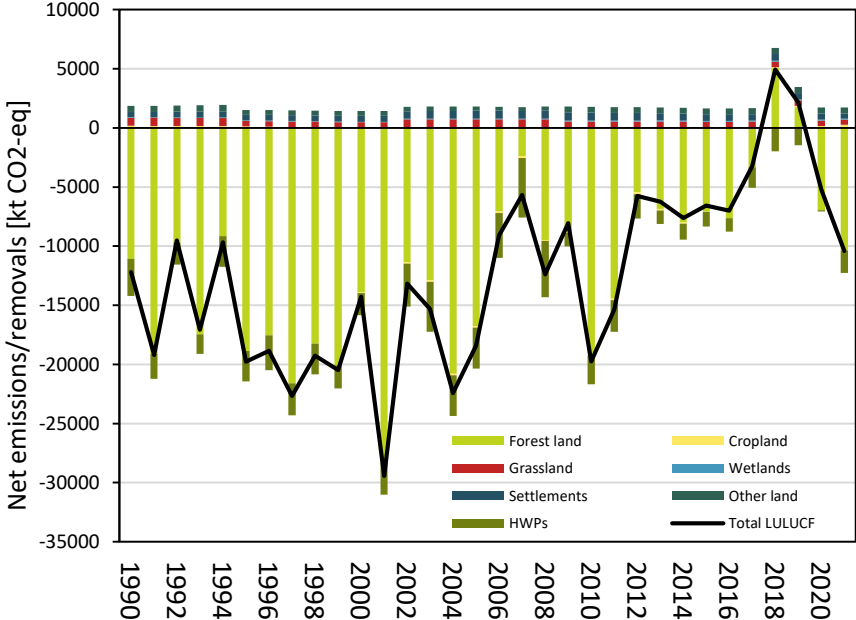
18. AUSSCHREIBUNG
ENREICHFRIST: 01. DEZEMBER 2021, 12:00 UHR
LEITPROJEKT ENREICHFRIST: 25. JÄNNER 2022, 12:00 UHR
WIEN, SEPTEMBER 2021

ASAP
AUSSCHREIBUNGSLEITFADEN

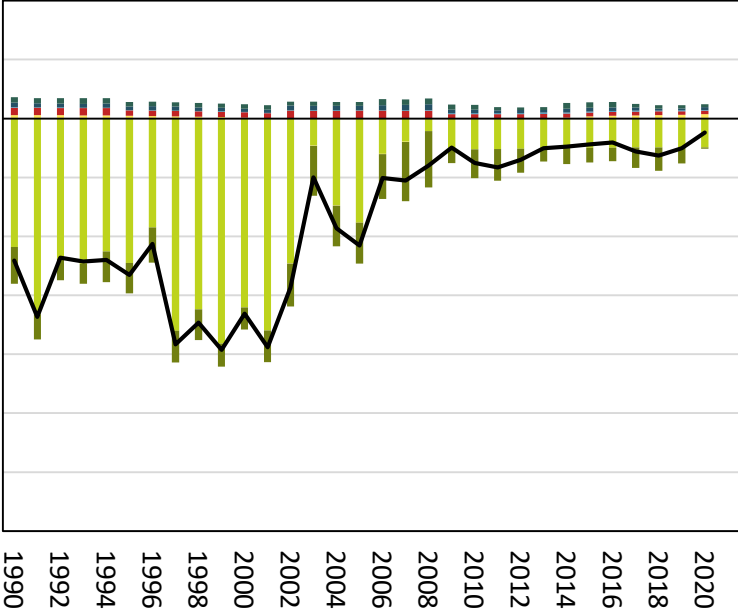
© FFG: <https://www.ffg.at/ausschreibung/Leitprojekt-18-asap-ausschreibung>

LULUCF: NIR 2023 vs. NIR 2022

LULUCF: NIR 2023



LULUCF: NIR 2022



Further use of the Austrian NFI

- National Forest Inventory will continue to be the most important source of input data to the Austrian LULUCF inventory
- Airborne and satellite remote sensing set to play an increasing role within the NFI
 - *Waldlayer*
 - R&D ongoing with respect to integrating ALS and Sentinel-2 data
- Basis for the NFI remains the in situ sampling at the permanent plots
 - Back-to-back 6 year NFI cycles
 - Annual sampling (1/6 of the plots) to provide preliminary annual input data before NFI cycle completion



© BFW: https://bfw.ac.at/cms_stamm/050/PDF/BFW-Praxisinfo50_waldinventur_fertig_web.pdf

Summary and perspectives

- Compilation of the Austrian LULUCF inventory will become increasingly reliant on remote sensing data:
 - Current inventory improvements based on national datasets from airborne remote sensing
 - Added value of satellite-based remote sensing evaluated continually
- National Forest Inventory will continue to be the most important source of input data to the Austrian LULUCF inventory
 - Airborne and satellite remote sensing set to play an increasing role within the NFI
 - Basis for the NFI remains the in situ sampling at the permanent plots, with frequency of sampling and data provision to increase
 - Annual sampling to provide preliminary input data to the Austrian LULUCF inventory before NFI cycle completion

Thank you for your attention!

Bradley Matthews

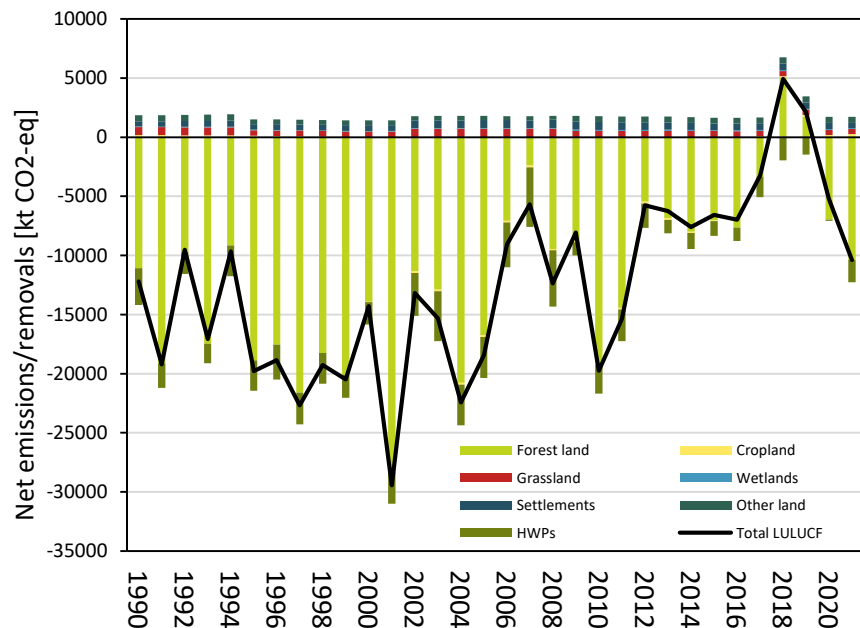
+43 1 31304 5946

bradley.matthews@umweltbundesamt.at

Umweltbundesamt
www.umweltbundesamt.at

JRC LULUCF Workshop
Ispra ● 11-12 May 2023

LULUCF GHG Emissions/Removals 1990-2021



- LULUCF significant contributor to the GHG balance of Austria
 - 1990: Net uptake of 12,2 Gt CO₂eq (15% of the national total emissions without LULUCF)
 - 2021: Net uptake of 10,4 Gt CO₂eq (13% of the national total emissions without LULUCF)
- Forest land dominant driver of sector level and trend
- Large interannual variations, declining sink strength over last two decades
- Relatively large uncertainty (48%) compared to other sources of CO₂
- Substantial improvements in methods since NIR 2022