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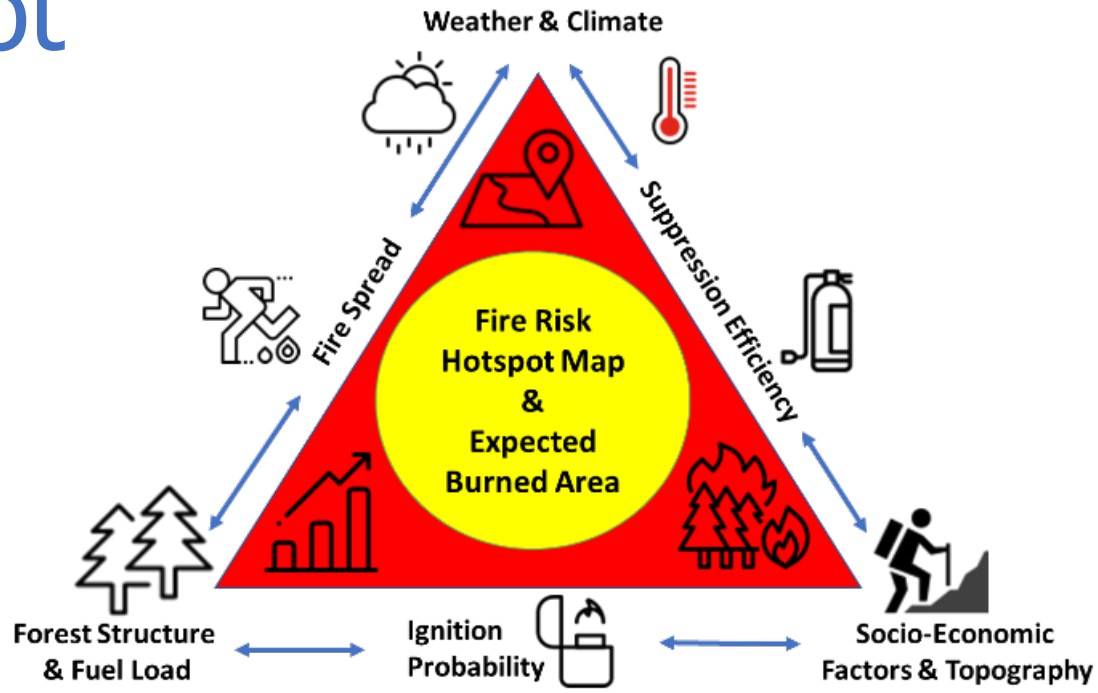
Austria Fire Futures (AFF): Integrated Future Wildfire Hot Spot Mapping for Austria

Consortium* of IIASA, BOKU, and BfW

Funded by Klimafonds ACRP

Klimatag 2024 – 2-4 April 2024



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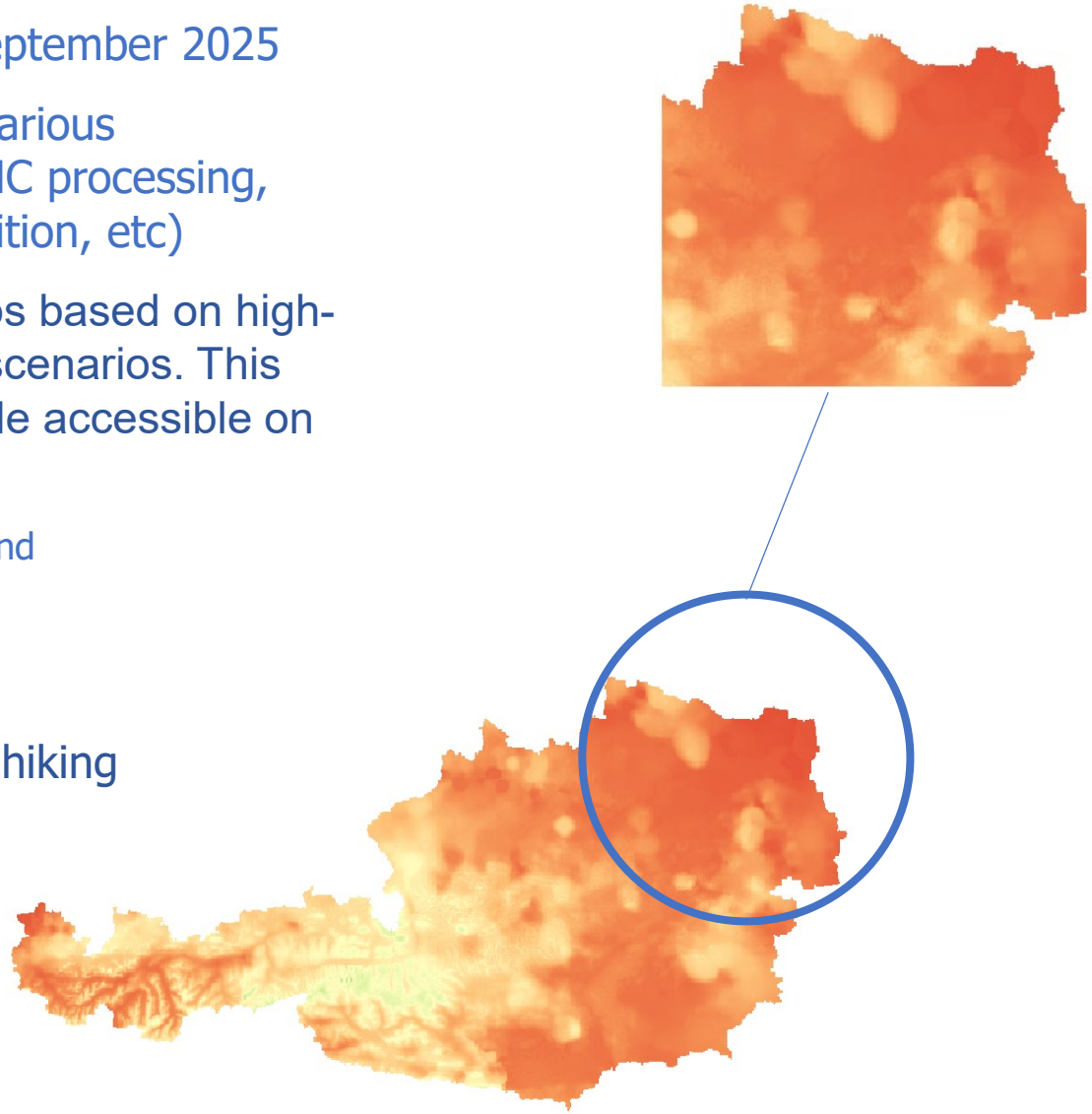
Austria Fire Futures (AFF): Overview

- 3 consortium partners: IIASA, BOKU, and BfW
- Project length of 3 years, running from September 2022 – September 2025
- Dissemination at various events (eg EGU 2023, 2024), with various components of the project resulting in publishable work (FFMC processing, identification of socioeconomic variables important to fire ignition, etc)

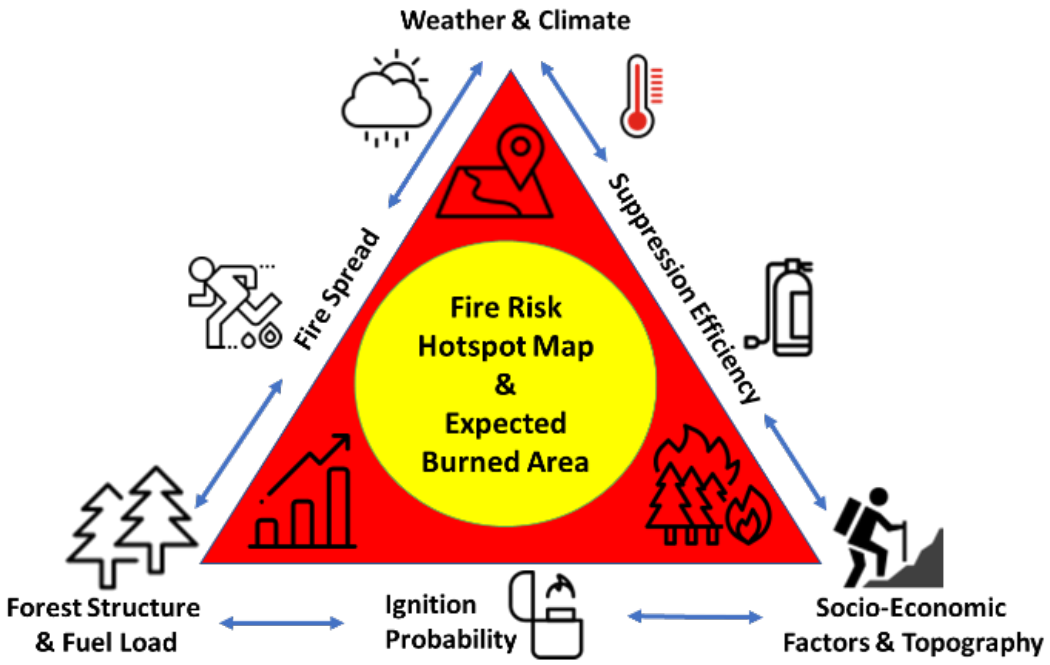
The project is a proactive effort to develop dynamic fire risk maps based on high-resolution hotspots mapping and under various climate change scenarios. This will be implemented for Austria and a case study region and made accessible on an online platform to:

- better understand how higher-resolution data impacts fire risk mapping, and
- analyze new variables for risk assessment and handling
- provide targeted feedback on multiple scales

Based largely on the Rax/Hirschwang fire and its popularity as a hiking destination, AFF chose Lower Austria as a case study region



Aims and Methodology



1. Develop a model to monitor fuel structure in Austria
   - Incorporate fuel observations, topographical information (slope, aspect, soils), gridded climate and forestry data, fire history and harvesting to ensure realistic outcomes in changing fire regimes and forest management
2. Improve forest fire management and fire risk reduction through updated fire risk hotspot maps for Austria
   - Adapt and calibrate the wildfire climate impacts and adaptation model (FLAM) to Austrian conditions, including new variables (tourism, resources, etc), and provide hotspot maps under future climate conditions
3. Better understand the role of tourism in forest fire risk and suppression
   - Conduct field study in tourism-rich Rax mountain range to understand visitor understanding and preferences related to forest fires and fire management; and to evaluate touristic role in fires
4. Provide fire risk hotspot maps and recommendations for fire management to stakeholders

Motivations Behind AFF

- Global warming is predicted to cause
  - an increase in temperatures and lightning;
  - a decrease in precipitation, relative humidity, and snow-pack; and
  - compounding hazards (storm damage, beetle infestations, etc) that will destabilize forests and ecosystems
- The fires in Absam, Tyrol (2014) and Rax/Hirschwang (2021), which each saw burns >100ha, required over 1500 and 9000 emergency responders, and fire protection and post-fire mitigation cost of 2 Mio and 30 Mio Eur, respectively
- Wildfires are one of the fastest growing threats to forests and societies globally, and Austria has the opportunity to respond proactively versus reactively

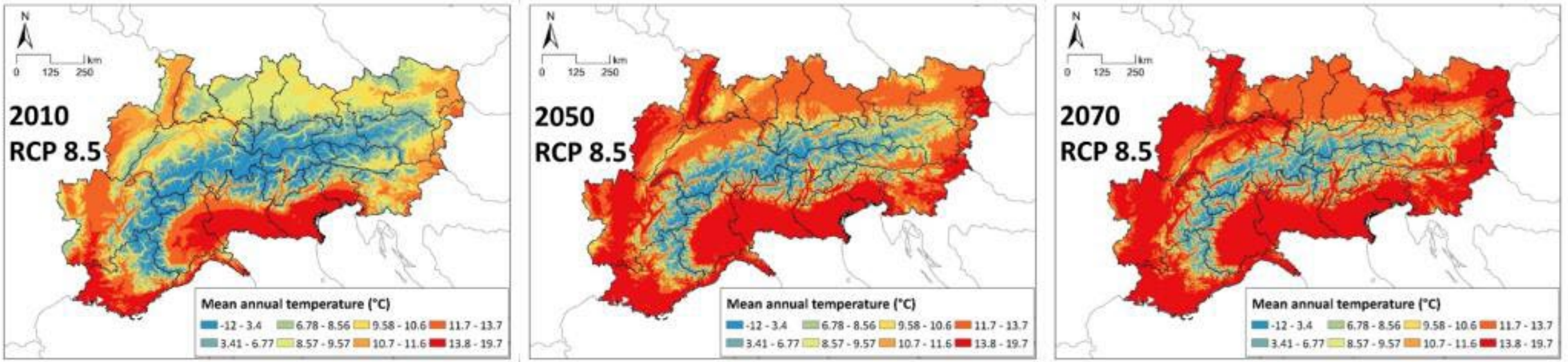
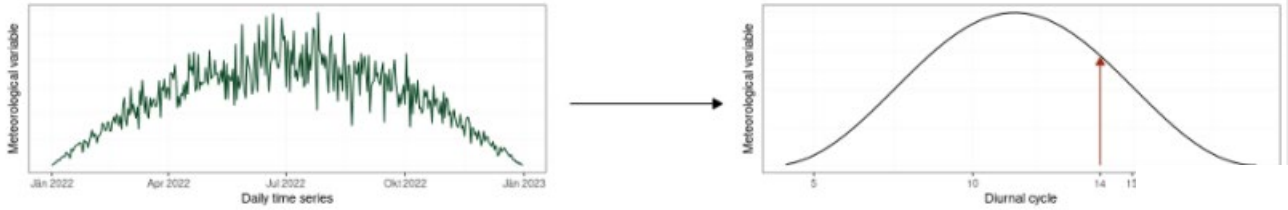


Figure: Mean annual temperature in the Alpine Region for RCP 8.5; 2010 + projections 2050, 2070. IIASA compilation, based on CHELSA climate.

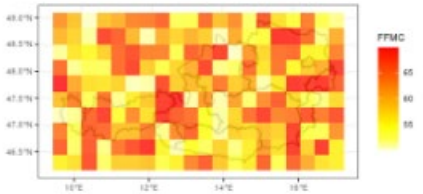
Current Progress and Results - Weather

Step 1: Downscaling meteorological data

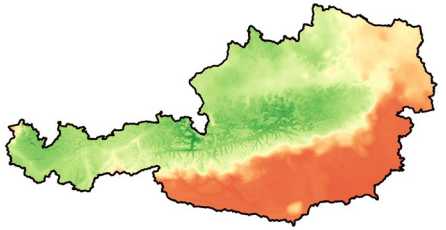
Step 2: Estimating 14 hour data out of daily time series



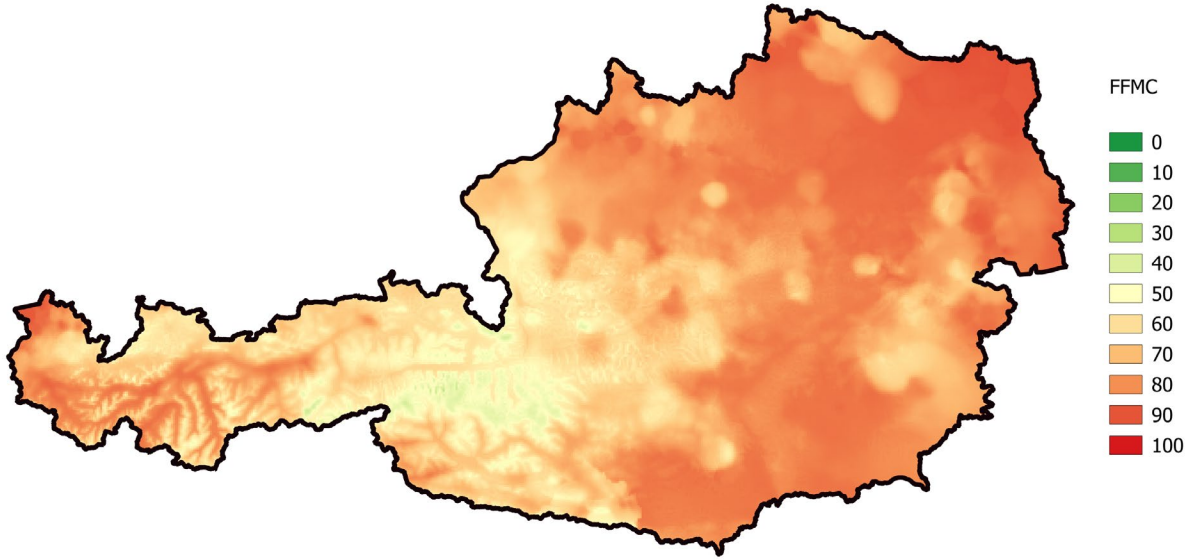
Step 3: Computing Fine Fuel Moisture Code (FFMC)



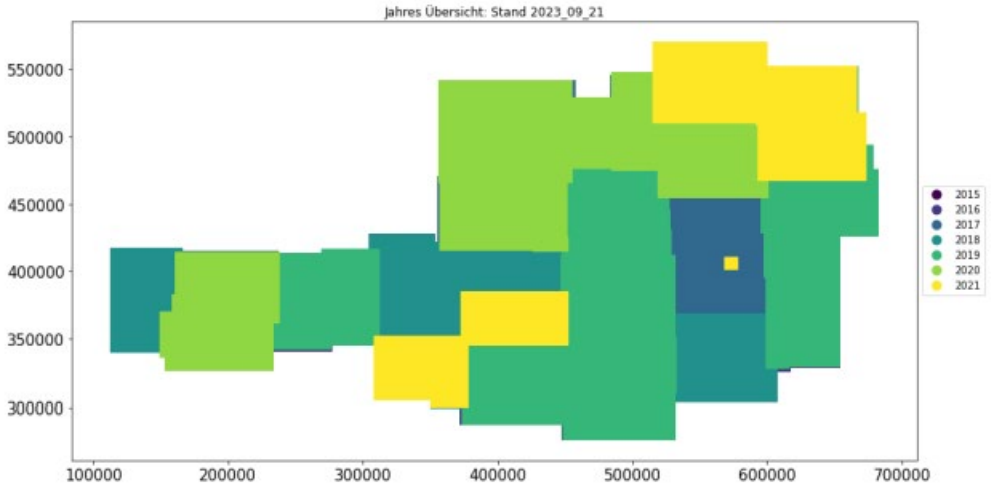
FFMC 2 February 2020

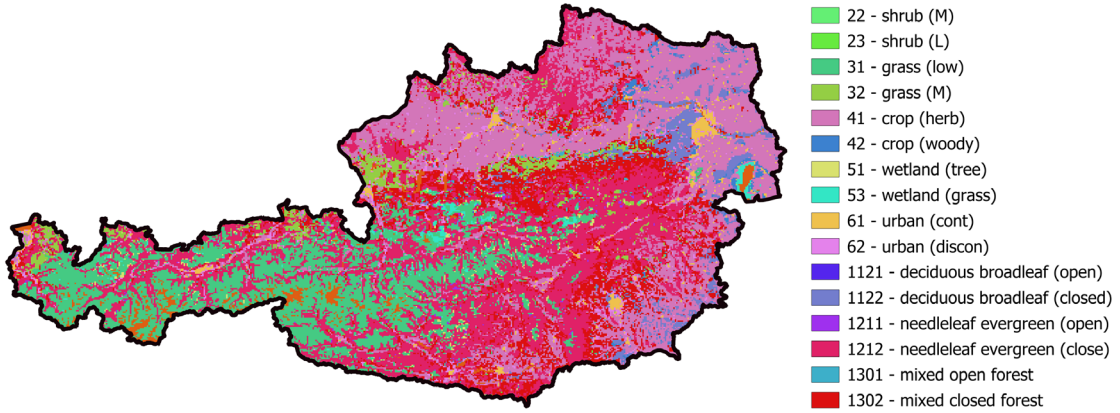


FFMC 26 July 2020



Current Progress and Results - Fuel





Probability of forest fire conditional on fuel available for burning

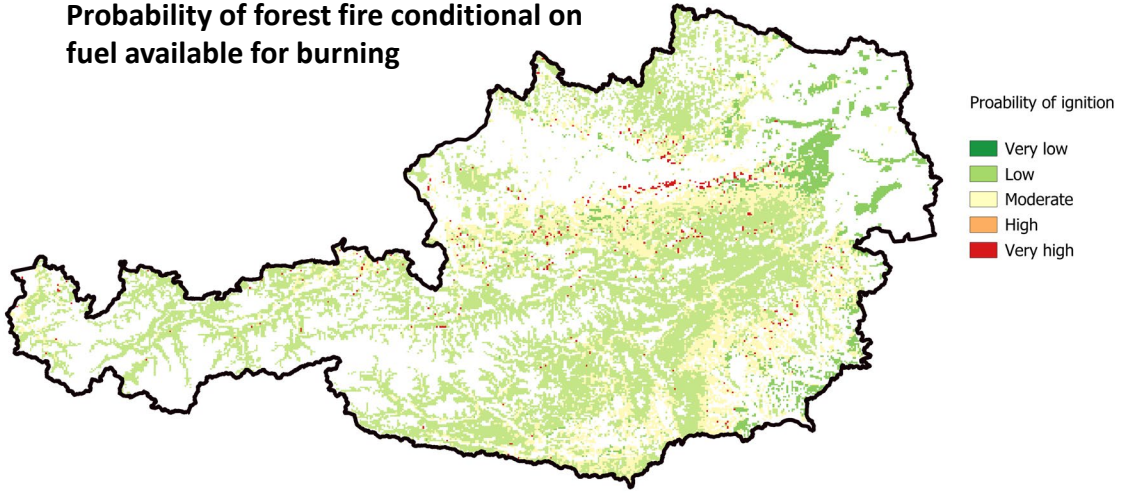
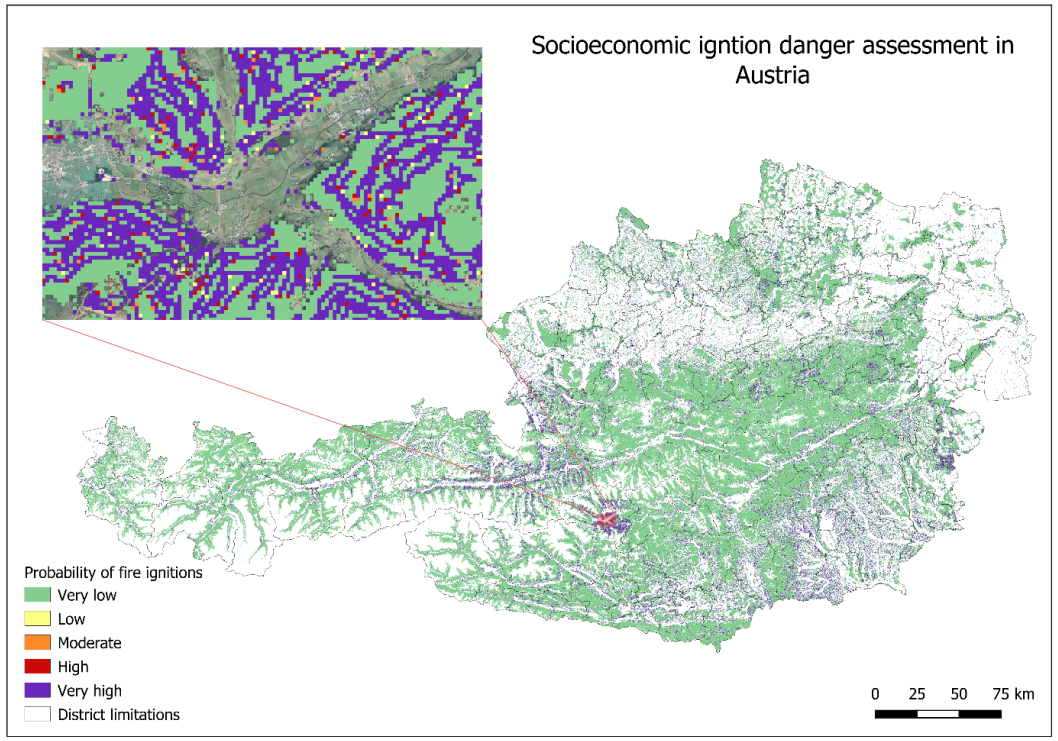


Table 1. Forest fuel types from FirEUrisk project.

Code	Name	Class
1111	Open broadleaf evergreen forest	Broadleaf
1112	Closed broadleaf evergreen forest	
1121	Open broadleaf deciduous forest	
1122	Closed broadleaf deciduous forest	
1211	Open needleleaf evergreen forest	Needleleaf
1212	Closed needleleaf evergreen forest	
1221	Open needleleaf deciduous forest	
1222	Closed needleleaf deciduous forest	
1301	Open mixed forest	Mixed
1302	Closed mixed forest	

Current Progress and Results – Socioeconomic variables



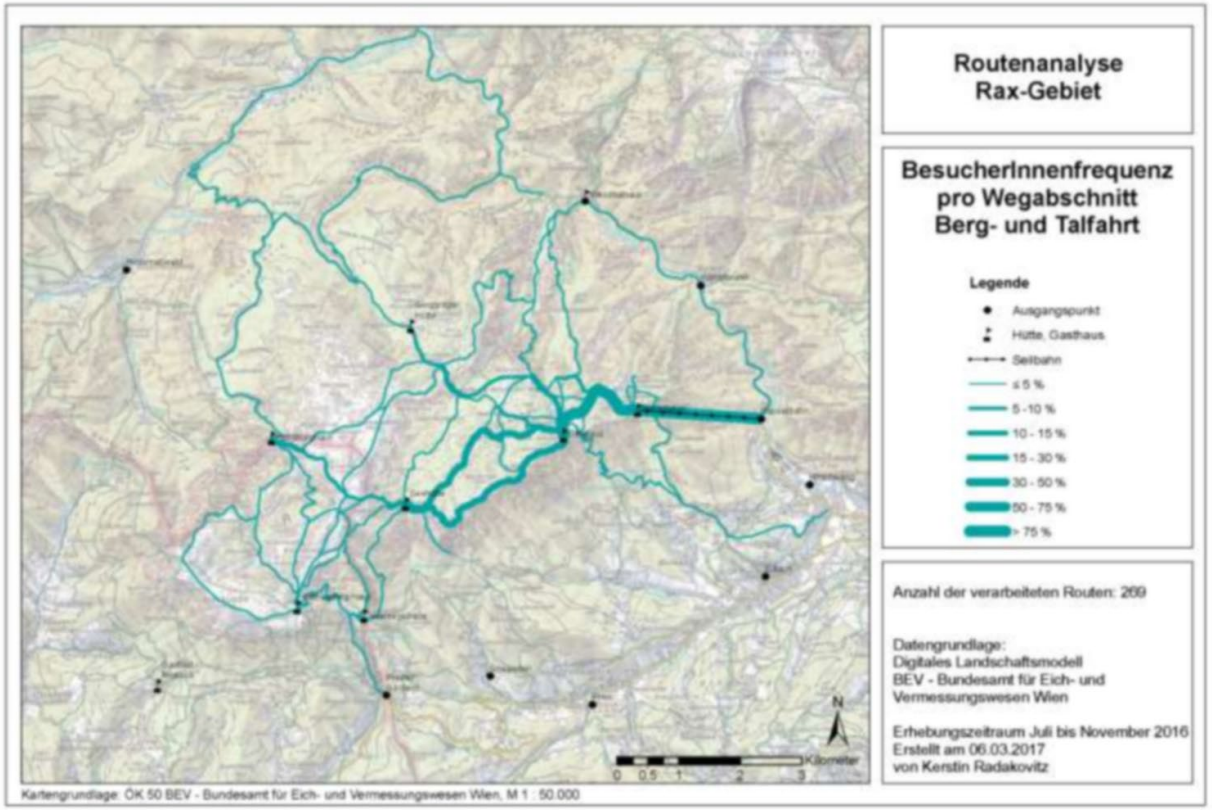
Out of 81 variables, 5 were found to be significant for fire ignition:

- Main railways
- Cable cars and other roads
- Other roads
- Transregional road network
- Number of residents (main, secondary residences)

Type of dataset	Layer	Name of dataset	Description of dataset	Data format	Scale	Data source
Original data	Buildings	RegStat_Raster_100m_Basis_2020	Shapefiles which contains buildings location and information of e.g. number of residential buildings, number of residents with main residence in a 100x100m grid	Shapefile	100x100m	BML
Original data	Buildings	RegStat_Raster_100m_Gebaeude_2020	Information about buildings e.g.number of hotels, number of cultural buildings, number of office buildings, etc in a 100x100m grid	Shapefile	100x100m	BML
Original data	Buildings	RegStat_Raster_100m_Haushalte_2020	Information on number of private households, XY coordinates of center point of the grid, etc in a 100x100m grid	Shapefile	100x100m	BML
Original data	Roads	alm_forstrassen_austria	Shapefile of alpine and forest road	Shapefile		BML
Original data	Roads	sonstige_strassen_austria	Shapefile file of 'other roads'	Shapefile		BML
Original data	Roads	rad_fusswege_austria	Shapefile of bicycle and hiking trails	Shapefile		BML
Original data	Roads	seilbahnen_sonstige_austria	Shapefile of cable car and other roads	Shapefile		BML
Original data	Roads	lokales_strassennetz_austria	Shapefile of local road network	Shapefile		BML
Original data	Roads	regionales_strassennetz_austria	Shapefile of regional road network	Shapefile		BML
Original data	Roads	transregionales_strassennetz_austria	Shapefile of transregional road network	Shapefile		BML
Original data	Roads	transnationales_strassennetz_austria	Shapefile of highways without the tunnel areas	Shapefile		BML

Current Progress and Results – Tourism

- Ongoing inventory of the existing tourist infrastructure
- Mapping of risk behavior traces along hiking trails and picnic areas finished (open bonfires, cigarette butts, glass, etc): very few items found in the area, map in preparation



Challenges faced and uncertainty within the project

Challenges:

1. Data acquisition and processing
   - Some data is difficult to obtain, or takes a long time to obtain
   - eg response times (to fires) in each Bundesland must be obtained from each fire district
2. Data processing and delays
   - Processing takes time and is impacted by acquisition issues
3. Delays multiply
   - Delays in one step result in delays in subsequent steps
   - eg processing of wind speed at the highest project resolution has not been completed, and thus fire model calibration cannot be done for Lower Austria
4. Stakeholder engagement
   - including all relevant stakeholders, organizing a joint meeting when all parties are available

Uncertainty

1. Climate change
   - how the climate will evolve is uncertain
   - this is being addressed using multiple climate change scenarios to cover as many scenarios as possible.
2. Data accuracy
   - low-resolution or inaccurate data impacts accuracy of fire modeling
   - this is being addressed through higher-resolution alternatives and direct field observations.
3. Understudied role of humans
   - little work has addressed the human dimension of fire risk in Austria, and there is few resources to compare results
   - this is being addressed through multiple surveys, analyses, and stakeholder engagement.
4. Incomplete fire records
   - fire records can be incomplete or inaccurate
   - We are using the most up-to-date information available to reduce inaccuracies

Thank you for your attention!

Questions, comments, concerns?

Feel free to contact us!

IIASA

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On request, we can also provide contact info for our partners at BOKU and BfW