

Digital Tools for Rangers

A brief overview on digitization in nature conservation with an emphasis upon ranger work

2023-06-29 – Klemens Mrogenda – Federal Agency for Nature Conservation Germany (BfN)



Let's start with some general information...

Please excuse my english 😊

I am not a professional ranger by any means

This presentation has no claim for completeness

Respect different levels of knowledge –
Open atmosphere and feedback culture



// Short introduction – Me and my work for the BfN



My twin track strategy so far...



Some impressions



Field Guide Course, Amakhosi Game Reserve, South Africa

At a digial conference (re:publica) for the Federal Environment Ministry, Berlin, Germany



NaturschutzDigital 2022 Conference, Vilm, Germany



Some impressions



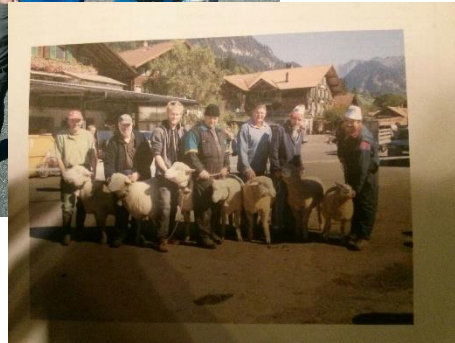
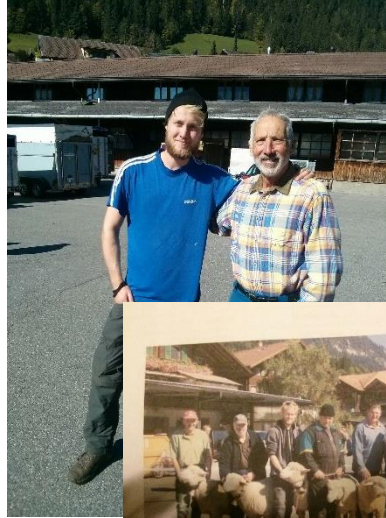
2019



Some impressions



Apple/IBM Hackathon in
Berlin, Germany

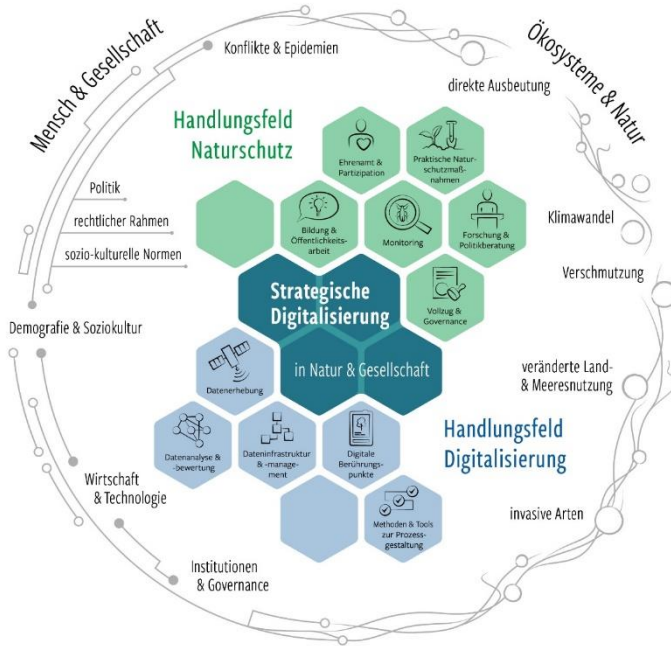


Shepherding Contest in
Oberwil, Switzerland



Rangertrip in Minnesota, USA

My current work at the BfN



- Division Strategic Digitization in Nature and Society
- Strategic guidance of digital activities @ BfN („Digital Strategy“)
- Research & publishing studies with regard to digitization in nature conservation
- Capacity building (politics, NGOs, public)
- Supporting digital projects within the BfN

// An unstructured view on digital tools for ranger work – My personal experience



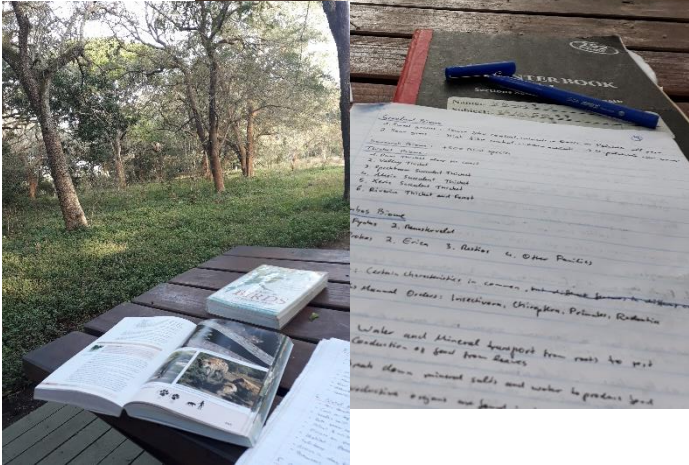
Field guiding in South Africa – track recognition & quiz apps



I wish there would be an app that could recognize every track or sign in South Africa...



Field guiding in South Africa – track recognition & quiz apps



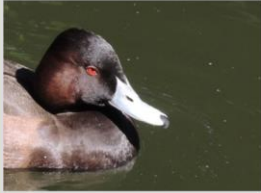
The Wildebeest's guide to South Africa

Explore SA Mammals Birds Other animals Plants Places About

This website features affiliate links, meaning we'll earn a small commission if you purchase through these links.

Bird Identification Game

Question 1 - What is this?



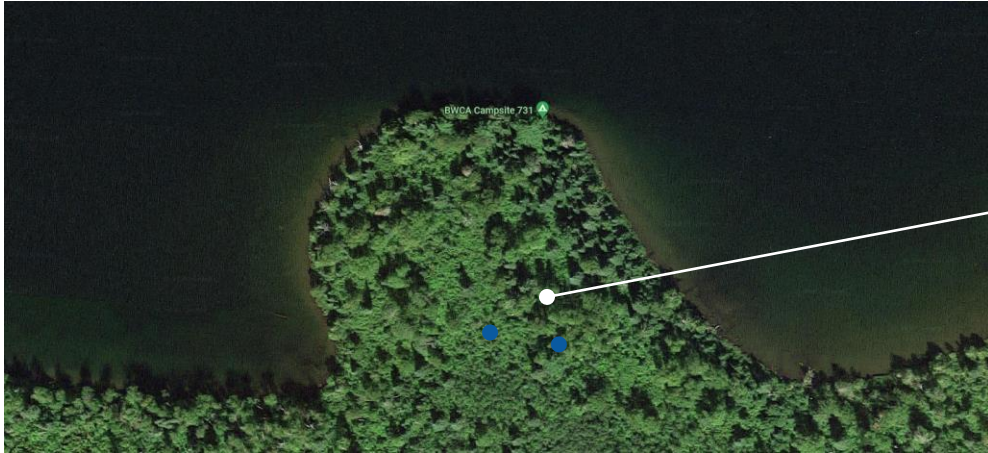
Score: 0 out of a possible 0

White-faced Duck Fulvous Duck Southern Pochard Yellow-billed Duck

Submit answer

AnkiDroid
Flashcards

Ranger in the Boundary Water Canoe Area Wilderness



Ranger in the Boundary Water Canoe Area Wilderness



Luke Skywalker

Local Guide · 94 Rezensionen

★★★☆☆ vor 8 Monaten

Super brushy campsite, not recommended



Shepherding in Switzerland



I wish drones can do the hard work for me, so i could focus on more important things...



// A structured view on digital tools
for ranger work – Risks & Potentials



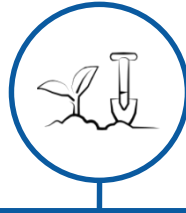
From paper to process – A problem statement



While there are a many promising nature conservation strategies from a global to national level, the practical implementation and monitoring of protected areas has not reached a satisfactory condition by any means!



From paper to process – A problem statement



Rangers are a major cornerstone to bring these strategies to life and work on their practical implementation

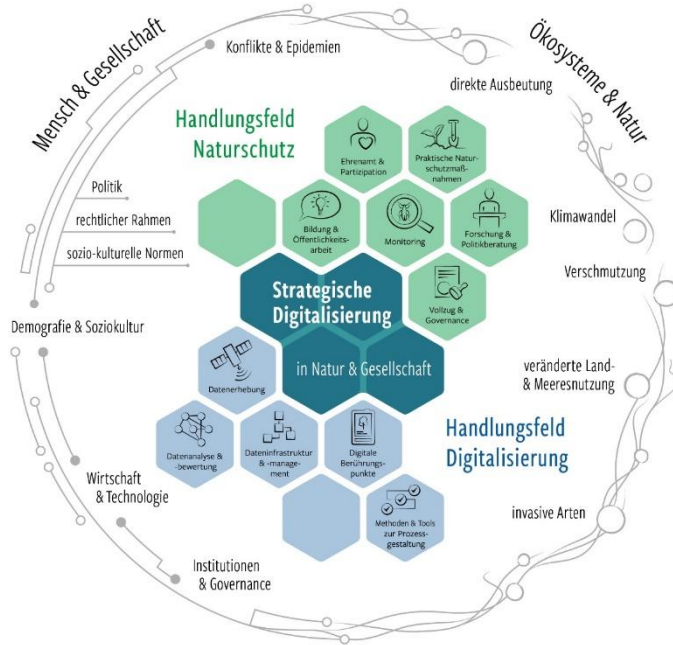
A study in nature sustainability states, that the expansion by 2030 to 30% coverage of protected areas will require around 1.5 million rangers, compared to the approximately 300.000 active rangers worldwide currently employed
(<https://www.nature.com/articles/s41893-022-00970-0>)

From paper to process – A problem statement



Digital solutions can empower rangers in their everyday work to make their job more safe, efficient, enjoyable and feasible

Digitalization as an area of activity can be structured along 5 categories



1. Data collection



2. Data analysis & -evaluation



3. Data management



4. Digital touchpoints



5. Methods & tools for process design



1. Data collection

Smartphones

Camera traps

Audiologger

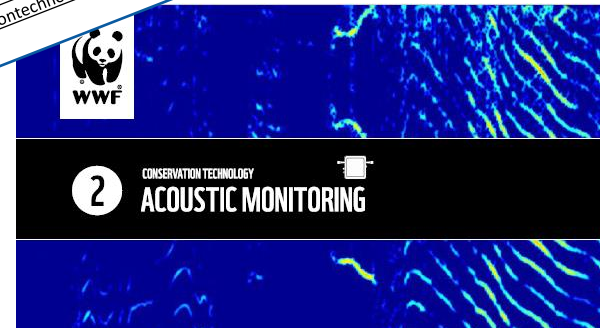
Drones / Airplanes

Satellites

eDNA



<https://www.wwf.org.uk/project/conservationtechnology>





1. Data collection – Best Practice



Detect poaching activities (Air Shepherd; Paul et. al., 2020; Kamminga et al. 2018)

Observe and count animals & plants (Van Gemert et al., 2015, Hu et al. 2020, Rominger et al., 2021)

Drone based detection of bark beetles through resin identification -> Smellscapes (PROTECT FOREST)

Detect illegal logging through LIDAR-Sensors (Samiappan et al., 2017)

eDNA - Detect organic material (DNA Barcode Scanner, <https://conservationx.com/project/id/4>)

Carcass-tracking through GPS-Vultures

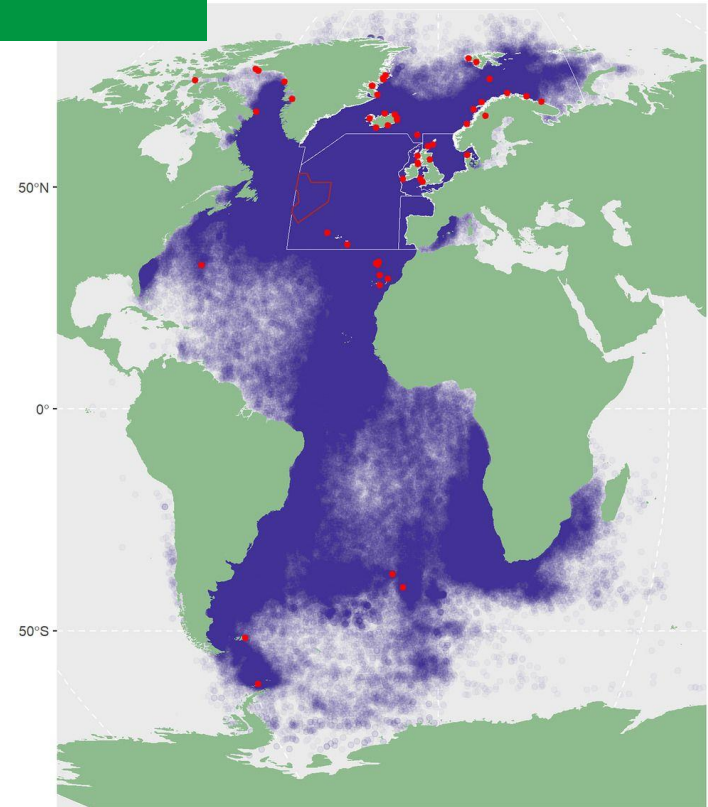


1. Data collection – Best Practice

From data to action:



*The NACES
Marine
Protected Area
(MPA) is the first
MPA on the High
Seas to be identified
from tracking data.”*





2. Data analysis – A little excursion on Artificial Intelligence



Generative Adversarial Networks (GANs)



2. Data analysis – A little excursion on Artificial Intelligence





2. Data analysis – Best Practice



Artificial Intelligence

Image Recognition

Sound/ Voice-
Recognition

Text analysis

Decision support /
modeling



2. Data analysis – Best Practice



Artificial Intelligence

Image Recognition

Sound/ Voice-
Recognition

Text analysis

Decision support /
modeling

- Detect poaching activities - Trailguard AI, Doull et al. 2021,
- Detect all kind of wildlife – Spacewhales, WildMe, Wildlife Insights, Flora Incognita, The Gaia Initiative
- Detect protected timber – KI Wood ID
- Detect timber transportation in car (WWF Space + Science)



{Time:"2020-03-18_17-15-52", Vehicle: "Logging truck", Probability:99%}



2. Data analysis – Best Practice



Artificial Intelligence

Image Recognition

Sound/ Voice-
Recognition

Text analysis

Decision support /
modeling

- Detect Wildlife (Birdnet, AMMOD, Natur 4.0)
- Detect illegal logging or poaching activities (Arbimon, <https://arbimon.rfcx.org/>)





2. Data analysis – Best Practice



Artificial Intelligence

Image Recognition

Sound/ Voice-
Recognition

Text analysis

Decision support /
modeling

- Chat GPT ? ;)



2. Data analysis – Best Practice



Artificial Intelligence

Image Recognition

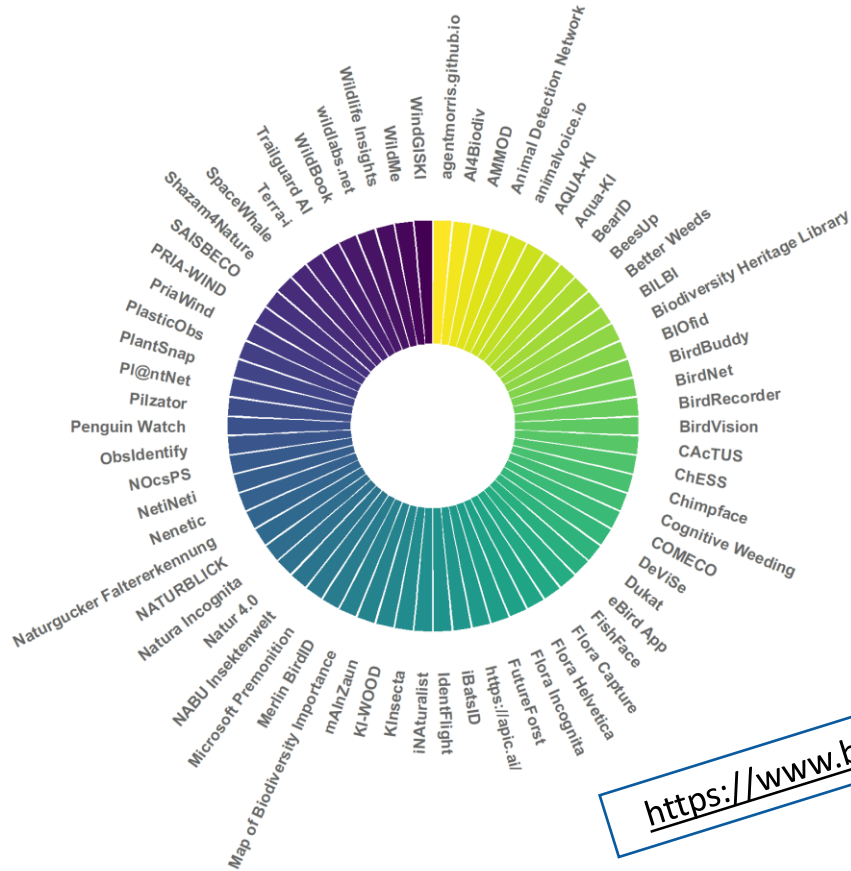
Sound/ Voice-
Recognition

Text analysis

Decision support /
modeling

- Selection process for protected areas (CAPTAIN-Project)
- Optimized patrols (PAWS (Protection Assistant for Wildlife Security))
- Carcass detection through data from vultures

AI tools in nature conservation



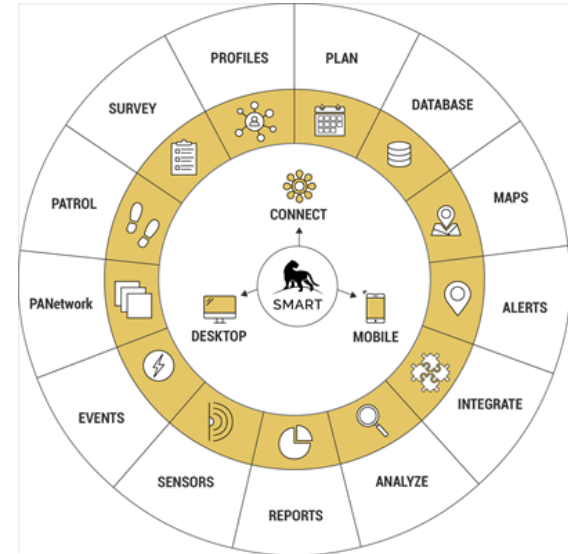
<https://www.bfn.de/digitale-anwendungen>



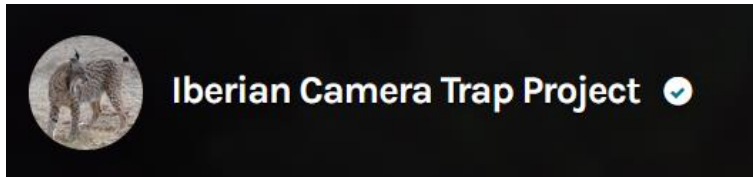
3. Data management



- The increasing amount of data produced makes a professional data management inevitable
- AI application need vast amounts of (labeled) training data -> Platforms like WildME or Zooniverse can help
- Tools like SMART, GLOBIL or Earth Ranger need to integrate multiple data sources and generate insights from it
- eDNA and metabarcoding approaches require data bases with genetic markers to identify wildlife within the collected probes (e.g. International Barcode of Life)



<https://smartconservationtools.org/>



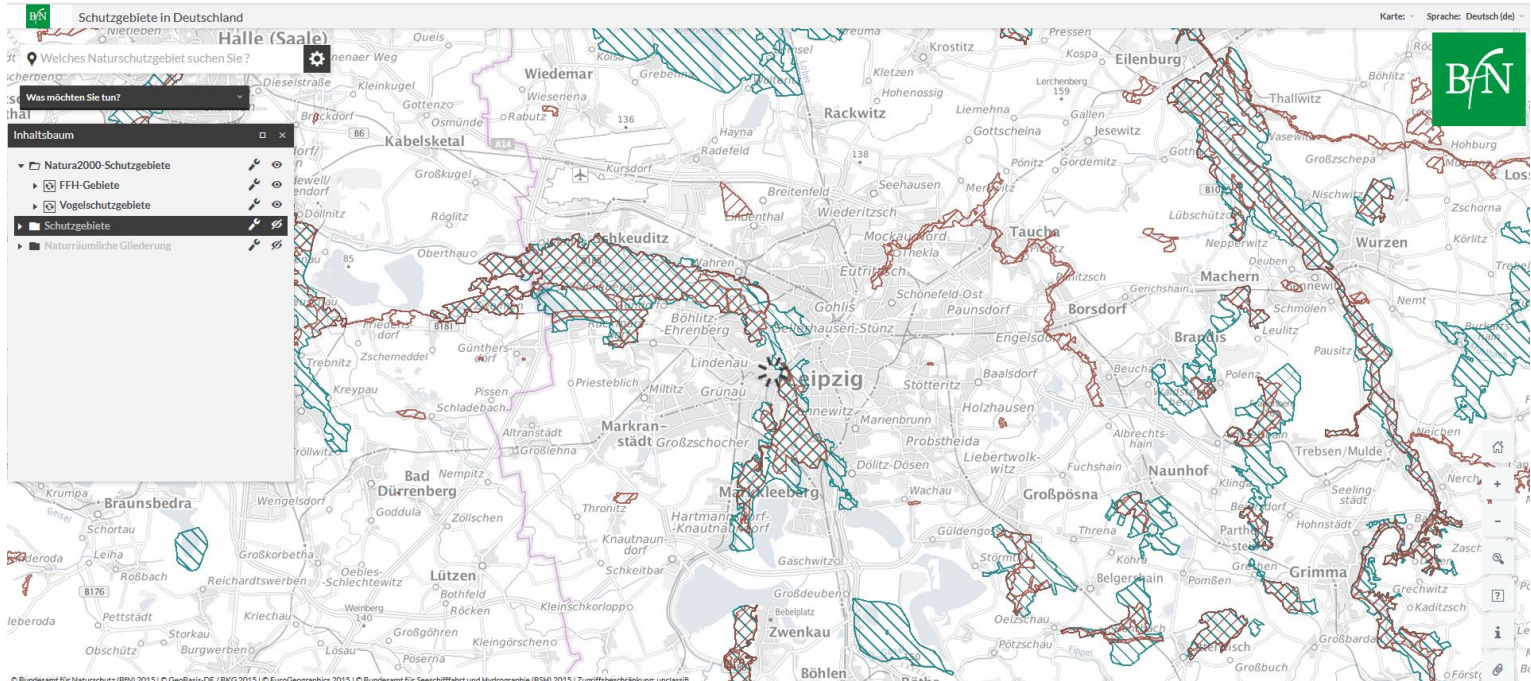
<https://www.zooniverse.org/projects/aicensusuhu/iberian-camera-trap-project/about/research>



3. Data management



- Working with georeferenced data is getting more and more important

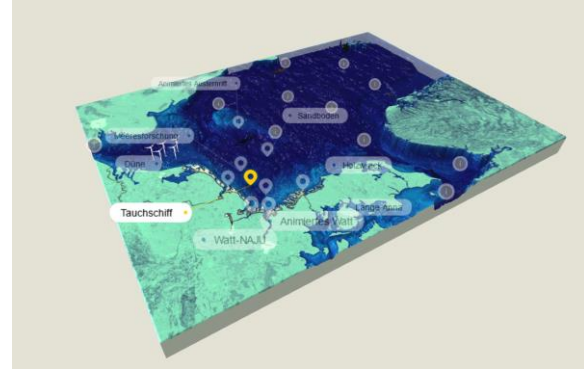




4. Digital touchpoints



- Especially relevant for educational aspects
- Virtual Reality (VR)
 - Virtual Ranger (Wilde Welten – Naturschutzwacht Brandenburg)
 - Virtual Environments (NordseeLife, OstseeLife – NABU, Natura2000 habitat types)



<https://nordsee-life.nabu.de/de/szene/karte>



<https://www.natura2000manager.de/vilm.html>



<https://www.expedition-wilde-welten.de/#>



4. Digital touchpoints

- Digital academies
 - Natura2000 Manager/in – BUND Deutschland
 - „Naturgucker Akademie“ – NABU Deutschland
- Apps with Gamification
 - Seek by iNaturalist
 - Flora Incognita
- Augmented Reality (AR)
 - Virtual Wildlife (WWF)



NABU | naturgucker
Akademie



<https://www.wwf.de/aktiv-werden/augmented-reality>

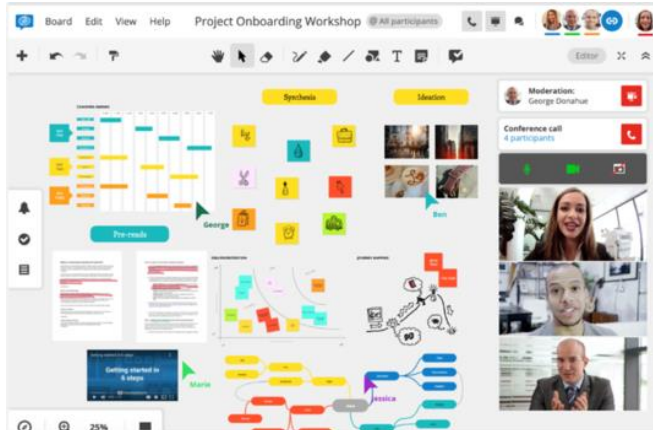




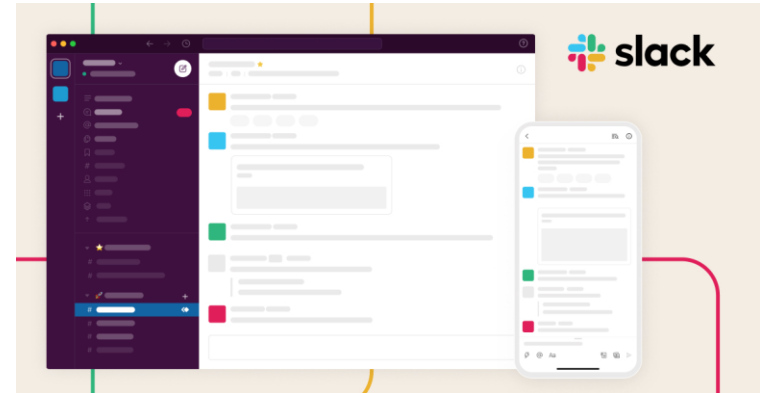
5. Methods & tools for process design – Non specific



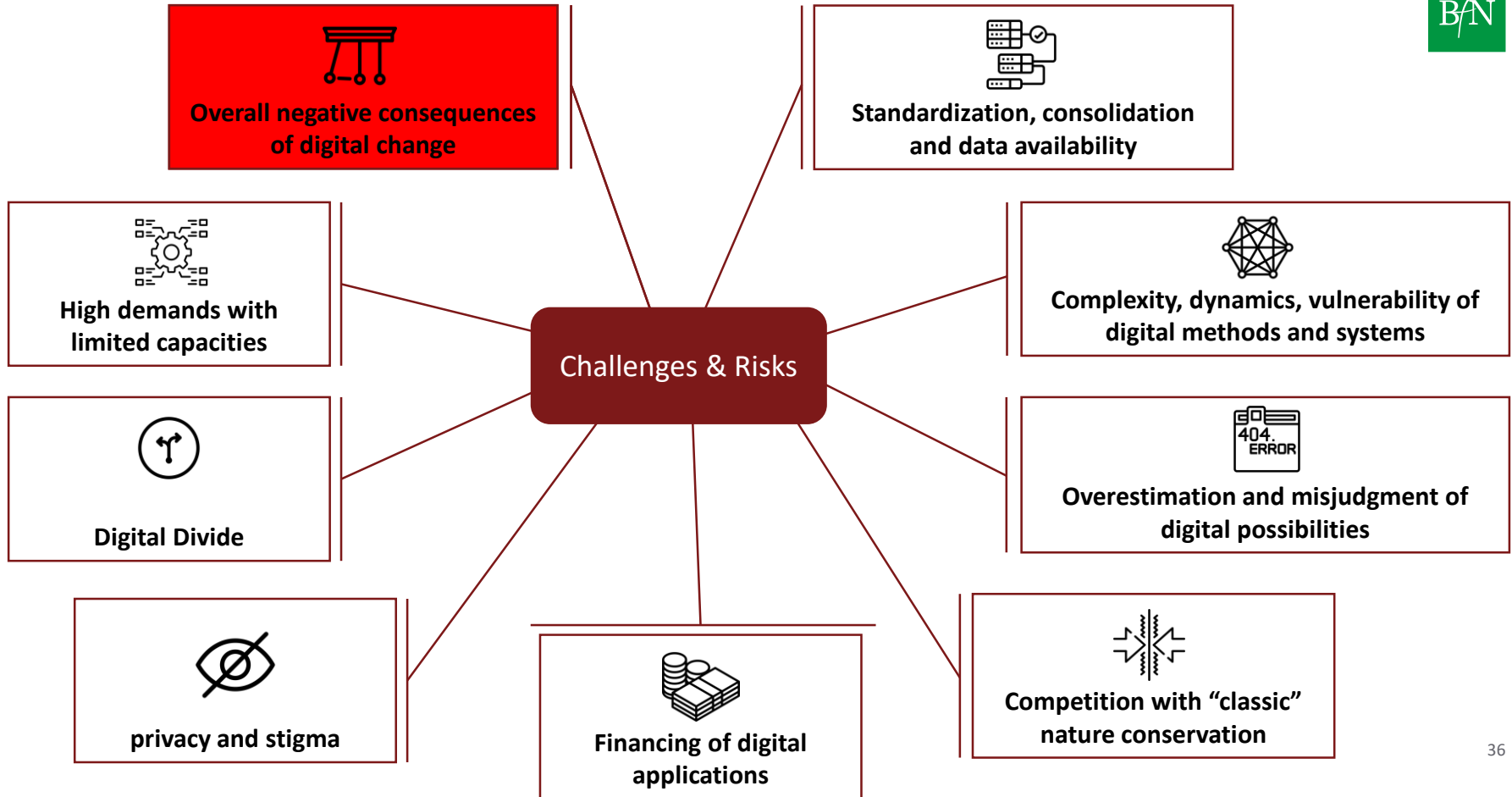
- Collaboration-Tools
- Task-Planning
- Design Thinking Toolbox



<https://conceptboard.com/de/>

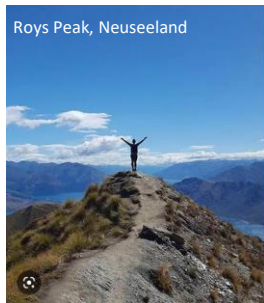


AI for Conservation
aiforconservation.slack.com



Challenges & risks of digital solutions

Negative impact of social media on protected areas



Study on social media & national parks

"According to the email interviews, conflicts related to the use of social media have already occurred in one in three national parks and are predominantly perceived as problematic and as a challenge for the administration."

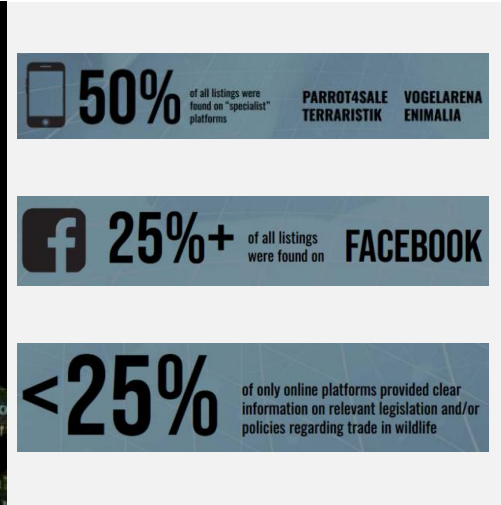
(Arndt 2021)

Challenges & risks of digital solutions



Illegal online trade with protected species and products

Disrupt: Wildlife Cybercrime



(ifaw 2018)

// Developing a holistic view on the use of digital tools



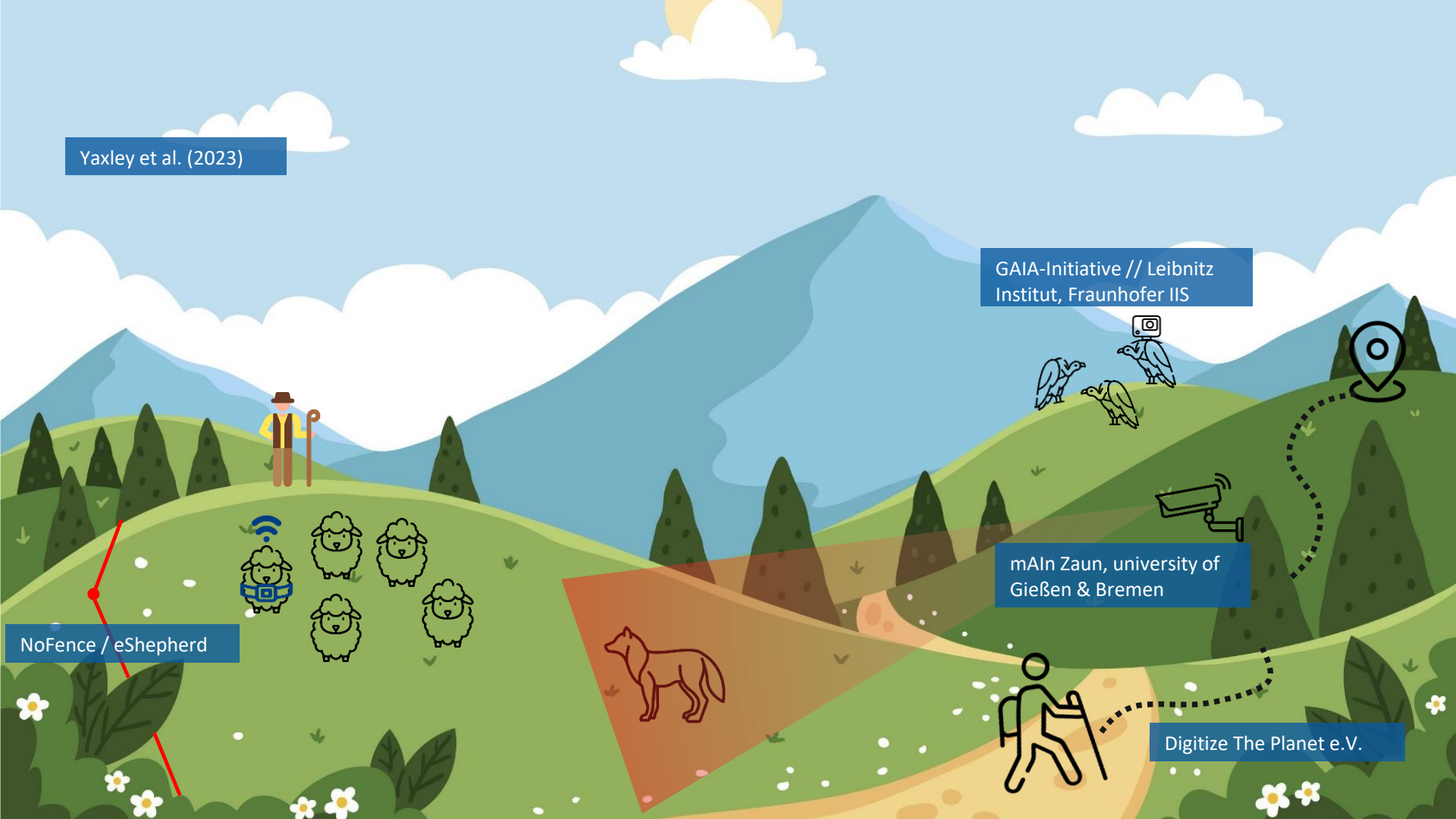
Yaxley et al. (2023)

GAIA-Initiative // Leibniz
Institut, Fraunhofer IIS

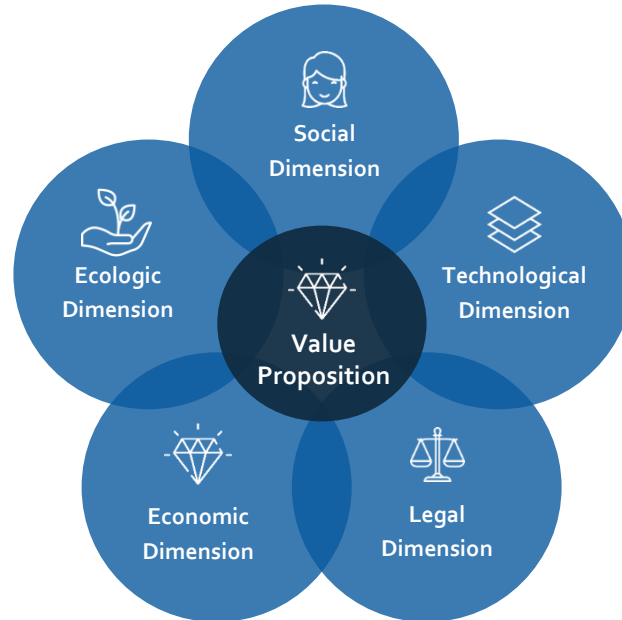
mAIIn Zaun, university of
Gießen & Bremen

Digitize The Planet e.V.

NoFence / eShepherd



Dimensions of a holistic view on digital projects



End then we came to an end...



Thank you for your attention 😊

I want to spend more time working in the field again –
Hit me up with interesting projects

Don't hesitate to contact me for further questions

Happy to discuss some thoughts on the presented topics
with you

Contact Information

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Projects / Apps



1. [Flora Incognita](#)
2. [iNaturalist](#)
3. [WWF Technology Series \(\)](#)
4. [Air Shepherd](#)
5. [PROTECT FOREST](#)
6. [DNA Barcode Scanner](#)
7. [Trailguard AI](#)
8. [Spacewhales](#)
9. [WildMe](#)
10. [Wildlife Insights](#)
11. [The Gaia Initiative](#)
12. [KI Wood ID](#)
13. [WWF GLOBIL](#)
14. [Birdnet](#)
15. [AMMOD](#)
16. [Natur 4.0](#)
17. [Arbimon](#)
18. [CAPTAIN-PROJECT](#)
19. [PAWS](#)
20. [Zooniverse](#)
21. [SMART](#)
22. [Earth Ranger](#)
23. [Wilde Welten](#)
24. [Nordsee Life](#)
25. [Natura2000 Manager](#)
26. [Naturgucker Akademie](#)
27. [Seek by iNaturalist](#)
28. [Virtual Wildlife WWF](#)
29. [NoFence](#)
30. [eShepherd](#)
31. [Digize the planet e.V.](#)
32. [mAIIn Zaun](#)

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5. Hu, J., Wu, X. & Dai, M. (2020) Estimating the population size of migrating Tibetan antelopes *Pantholops hodgsonii* with unmanned aerial vehicles. *Oryx*, *54*(1), 101–109. Available from: <https://doi.org/10.1017/S0030605317001673>.
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8. Arndt, S. (2022) *Soziale Medien als Auslöser von Konflikten in Schutzgebieten: Erfahrungen, Probleme, Lösungsansätze: Masterarbeit im Studiengang M. Sc. Ökologie und Umweltplanung, Fachgebiet Landschaftsplanung und Landschaftsentwicklung.*
9. IFAW (2018) *Disrupt Wildlife Cybercrime. Uncovering the scale of online wildlife trade.*, London. Available from: <https://www.ifaw.org/international/resources/disrupt-wildlife-cybercrime> [Accessed 28 September 2022].
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