

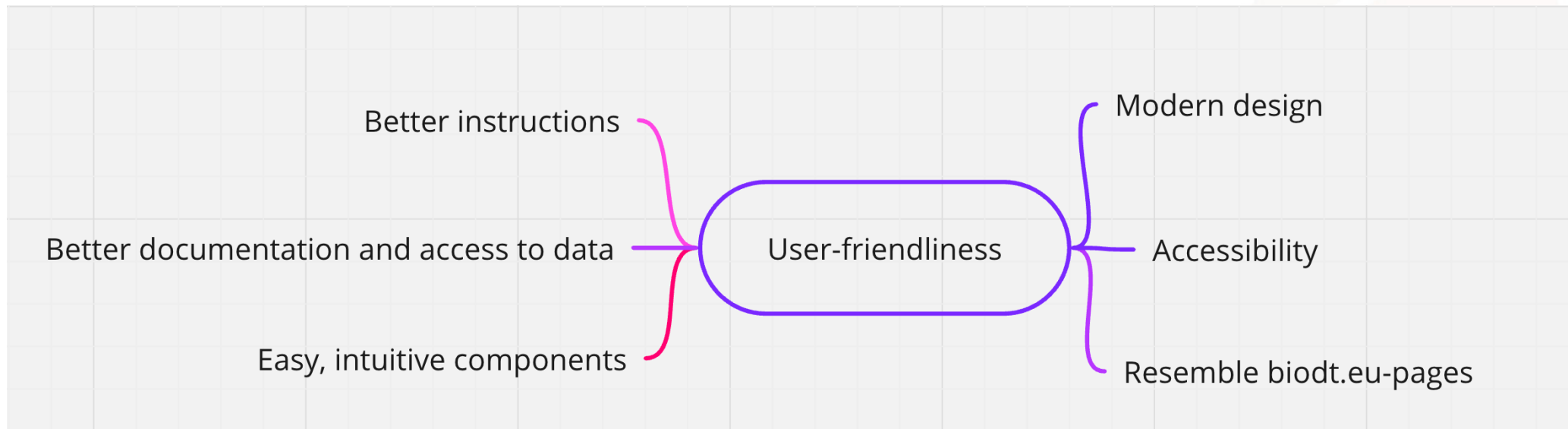


Demonstration of the Shiny App and Integration with Other BioDT pDTs

Honey Bee Prototype Digital Twin

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🔥 Shiny App redesign & development






Shiny App Demostration

User Personas & User Story Workshop

Usertype #1



Beekeeper

Actions, Motivations and Pains

What do I do?

- Keep bees
- Produce honey

Why do I do it?

- As a hobby
- Interest in nature
- Job

What do I want?

- Healthy bee colony
- Honey

What's stopping me?

- Diseases
- Weather
- Land use change
- Regulations

User Story

BEEKEEPER

As a beekeeper, I want to see how well the pDT performs for my bee colonies, out of curiosity.

BEEKEEPER

As a beekeeper, I want to see the impact of different management options for honey harvesting, to learn about suitable or better options.



Scientist

Actions, Motivations and Pains

What do I do?

- Research on bee survivability
- Research on honey productivity

Why do I do it?

- Beneficiality to the ecosystem and society

What do I want?

- Tool to help simulate different scenarios
- See whether simulations are sane and calibrated

What's stopping me?

- Poor findability of data
- Difficulties in comparing models
- Difficulties in defining scenarios
- Comparability of simulation with actual data

User Story

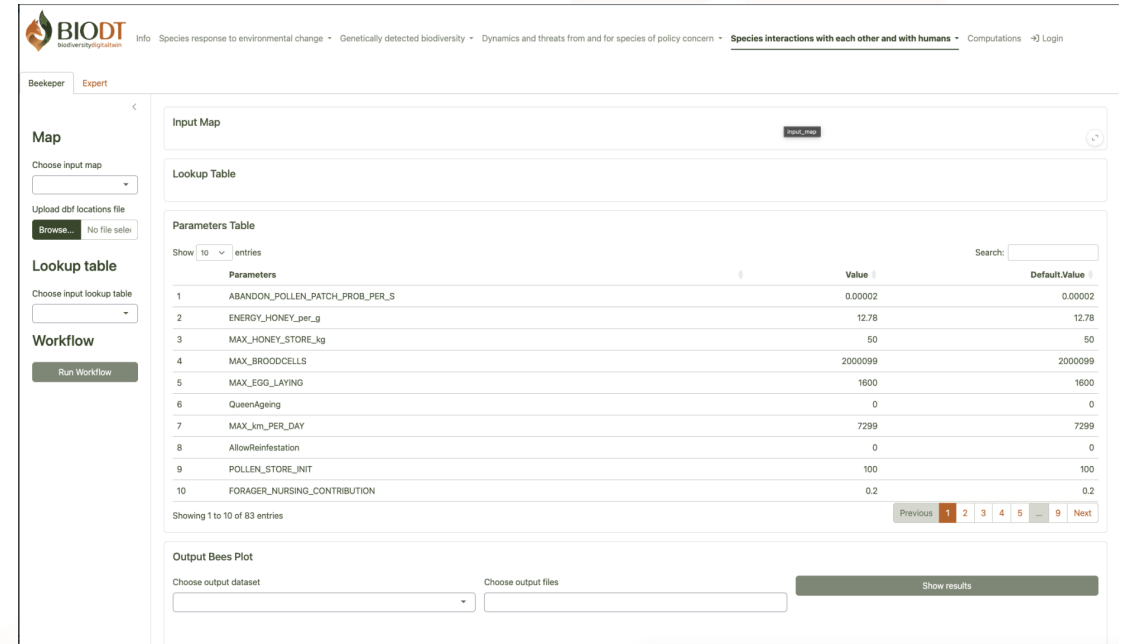
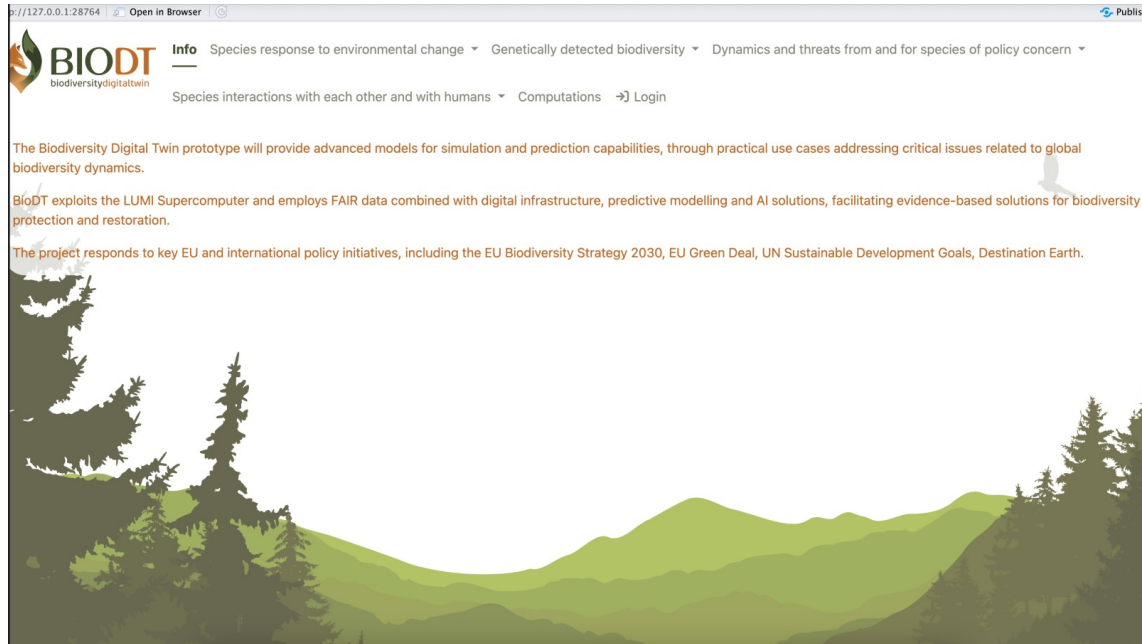
SCIENTIST

As a scientist I want to be able to define model parameters, execute model and visualise results so that I can study effect of different stressors on the bee survivability

SCIENTIST

As a scientist I want to make a model calibration so I can be confident the model is providing me with correct results which are comparable to reality.

What we have made so far – from this ...



... to this!

Prototype Digital Twins

The Biodiversity Digital Twin prototype will provide advanced models for simulation and prediction capabilities, through practical use cases addressing critical issues related to global biodiversity dynamics.

BioDT exploits the LUMI Supercomputer and employs FAIR data combined with digital infrastructure, predictive modelling and AI solutions, facilitating evidence-based solutions for biodiversity protection and restoration.

The project responds to key EU and international policy initiatives, including the EU Biodiversity Strategy 2030, EU Green Deal, UN Sustainable Development Goals, Destination Earth.

Species interactions with each other and with humans

Pollinators (Honeybee)

Honeybee Beekeeper Case

Instructions

- Select point on the map by first clicking the placement icon
- Adjust the parameters
- Change the lookup table values if needed
- Click the run simulation button

The simulation results can be seen in the output plot, select your experiment from the dropdown menu.

Input Map

First, click the placement icon and then select desired placement on the map.

Simulation Parameters

- Number of adult bees at the beginning of the simulation: 10000
- Number of Mites at the beginning of the simulation: 0
- Number of Infected Mites at the beginning of the simulation: 0
- Honey Harvest:
- Variola treatment with acaricide:
- Drone Brood Removal:
- Simulation length (days): 365

Lookup Table

In the landscape surrounding the hive, floral resources are considered only in the fields and meadows, called 'food patches'. Each food patch is characterised by the metrics listed below (the area in m² is given and cannot be changed). Pollen and nectar quantities are based on estimates of quantity per flower, number of flowers per plant and number of plants per square metre. For simplicity, and in the absence of more detailed data, the daily supply of nectar and pollen provided by the plants was assumed to be constant throughout the flowering period.

All values are based on previous studies (e.g. Horn et al. 2020, <https://doi.org/10.1002/bees.2216>) or a best guesses.

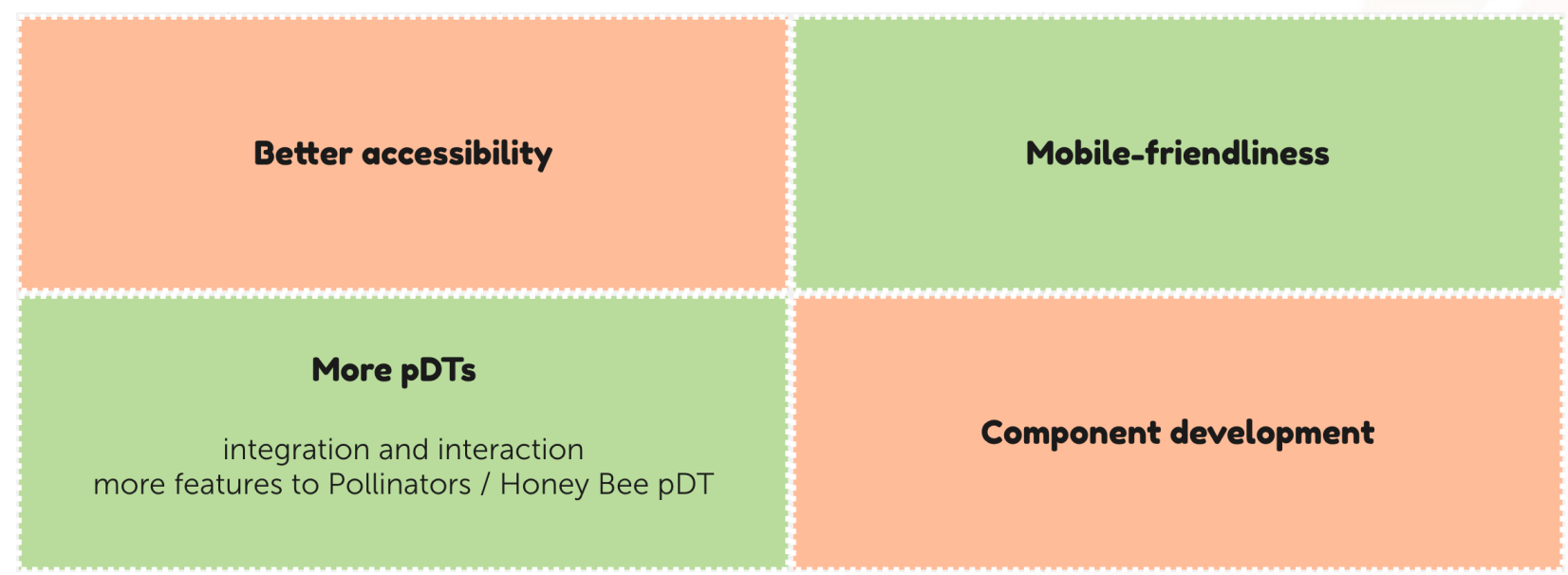
The user is encouraged to use own estimates or experiment using alternative values. You can double click the value to enter edit mode. Hover over the to get detailed description of the variables.

PatchType	quantityPollen_g	concentration	quantityNectar_g	nectarGathering_s	pollenGathering_s	flowerStart	flowerEnd
1 Rapeseed	0.13	1.3	0.0003	1200	600	114	11
2 Maize	0.752	0	0	0	600	197	2
3 Legumes	0.0302	1.242	0.0001019	1200	600	142	11
4 Strawberries	0.0078	1.161	0.0000055	1200	600	135	11
5 Stone Fruits	0.058	0.971	0.000186	1200	600	95	11
6 Asparagus	0.1861	1.811	0.000198	1200	600	152	2
7 Vines	0.91	1.71	0.000133	1200	600	152	2
8 Grassland	0.0121	1.262	0.00001	1200	600	1	31
9 GrasslandSeason	0.0121	1.262	0.0001	1200	600	151	2

Output plot

Choose experiment: Example

Future Shiny App





BIODT
biodiversitydigitaltwin

 @BiodiversityDT

 BioDT



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