

# Raw material extraction and nature conservation: Synthesis through innovation



**Interreg**  
**Italia-Österreich**  
European Regional Development Fund



CLEANSTONE  
Kickoff meeting  
Activities E.C.O.

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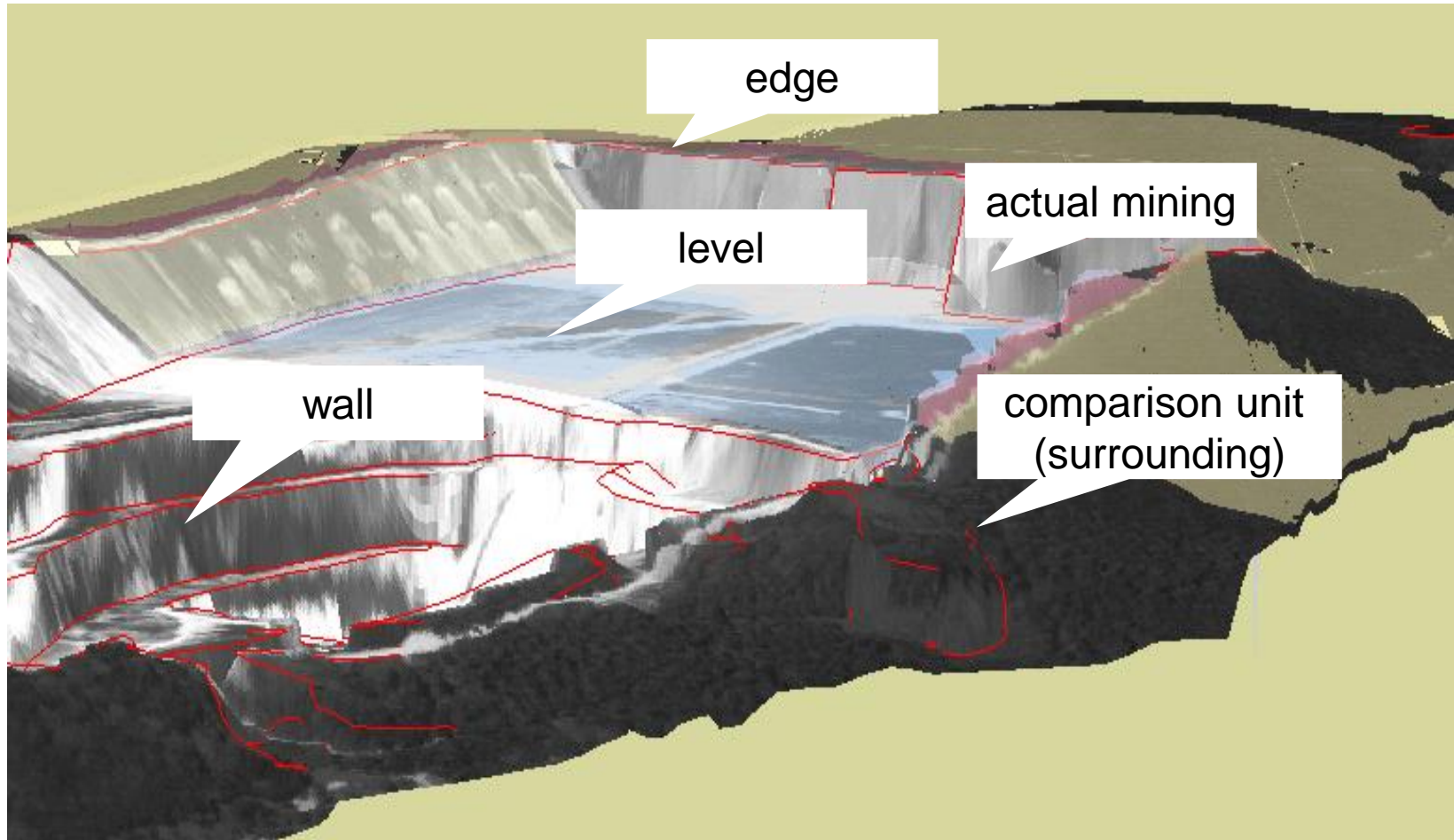
12 December 2019  
University of Udine

# Quarry and conservation

- A quarry can be a place of rich biodiversity
- The biodiversity of a quarry can be measured and „controlled“
- High biodiversity is not compulsory „produced“ by high costs



# Ecological quarry units



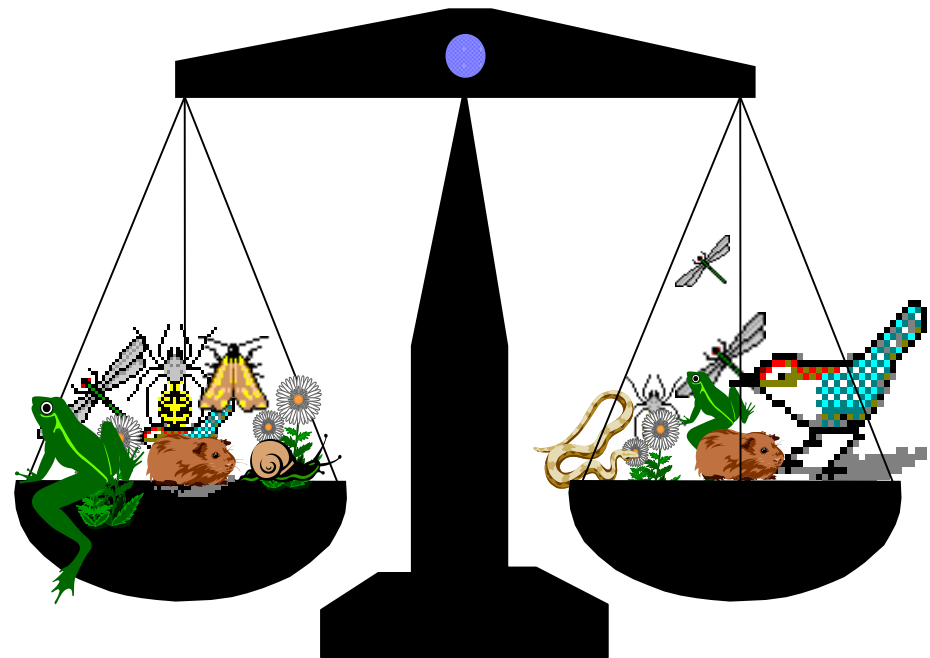


# Biodiversity

- Varsity of life
- Biodiversity is under increasing pressure
- Global demand for biodiversity assessment and conservation
  - European Biodiversity Strategy (2020 resp. 2030)
  - National strategies
  - Convention on Biological Diversity

# The basis of the LBI is the ratio between potential and actual biodiversity

The biodiversity is calculated by the number of different species and their rating in the Red List of threatened species



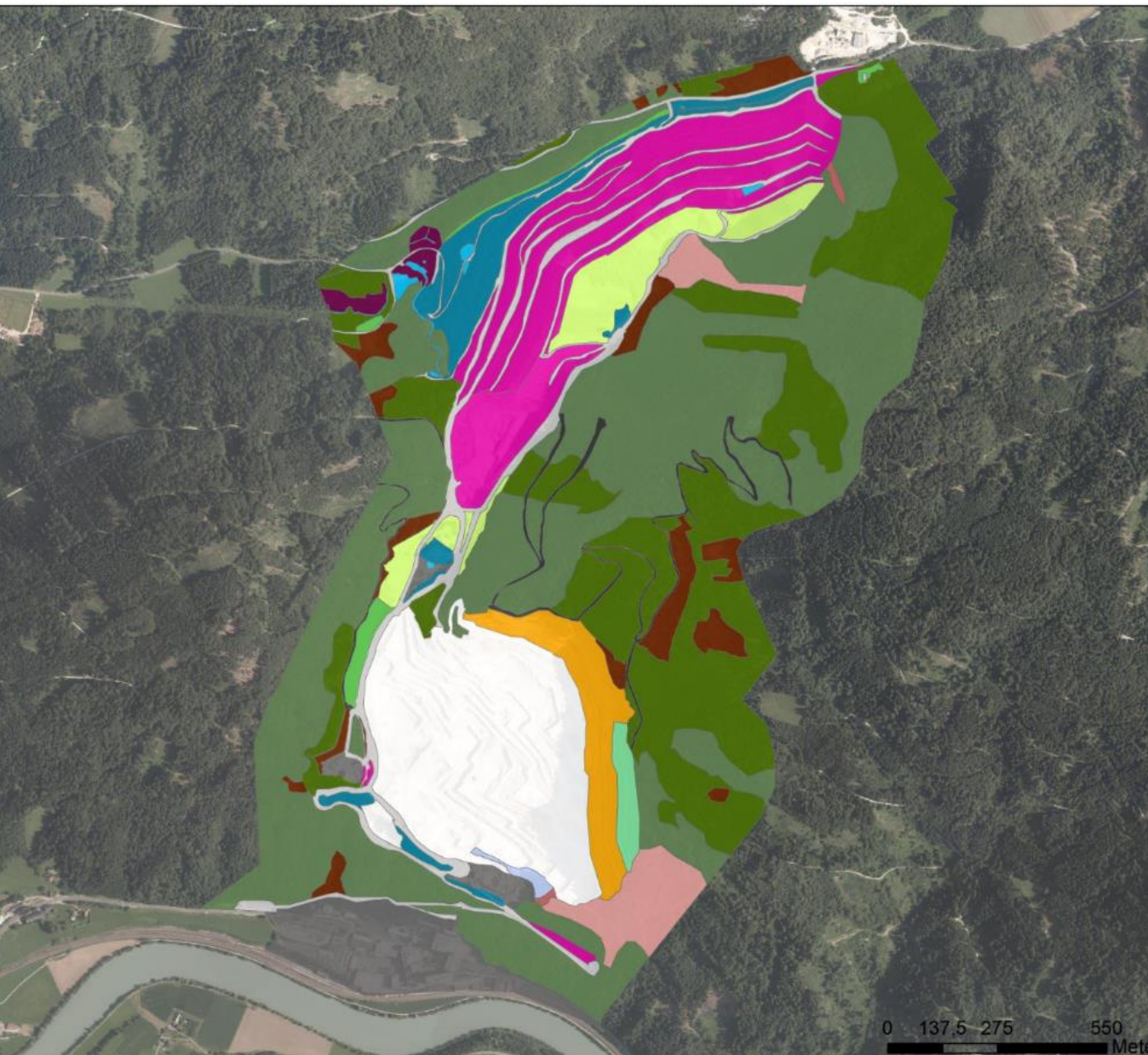
$LBI_{pot}$

$LBI_{act}$

# Overview

- LBI is being calculated via „Habitat Types“ and „Birds“
- Kooperation Omya, WWF, E.C.O.
- Basic investigation 2006
- Follow up: 2007, 2008, 2009, 2011, 2013 and 2015
  
- Raster grid of 50x50 m, randomized sampling plots
- 10x1m transects
- Presence/absence analysis
  - Birds
  - Spiders
  - Bats
  - Habitat types

# Habitat types



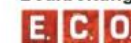
## Lebensraumtypen

- Abbaufläche
- Abraumhalde
- Bermen rekultiviert alt
- Bermen rekultiviert jung
- Betriebsgelände
- Buchen-Mischwald
- Fichtenwald
- Gewässer
- Infrastruktur
- Rekultivierungsböschung alt
- Rekultivierungsböschung jung
- Rotföhrenwald
- Schwarzerlenwald
- Waldschlag
- Wand Sukzession
- Waldweg
- Wiese
- Wärmegetönter Buchenmischwald

Auftraggeber: OMYA Gmbh



Bearbeitung:

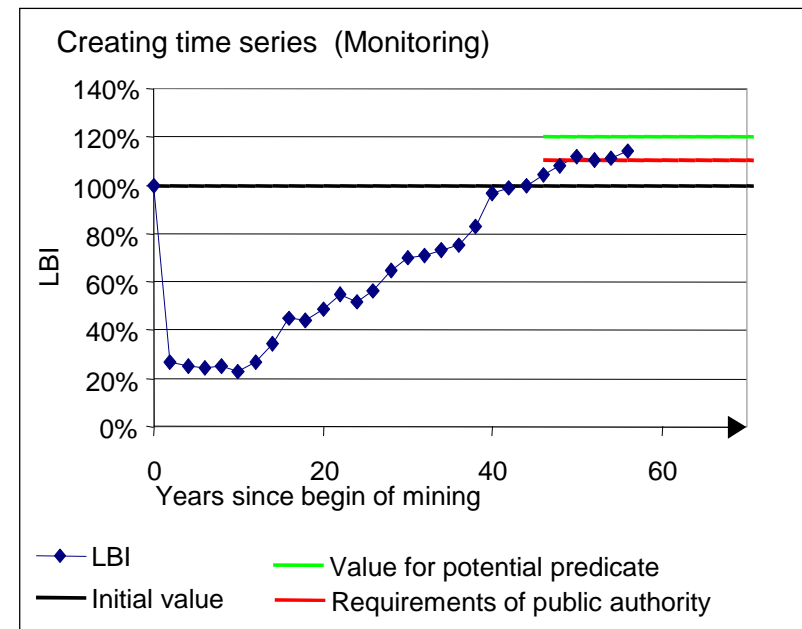
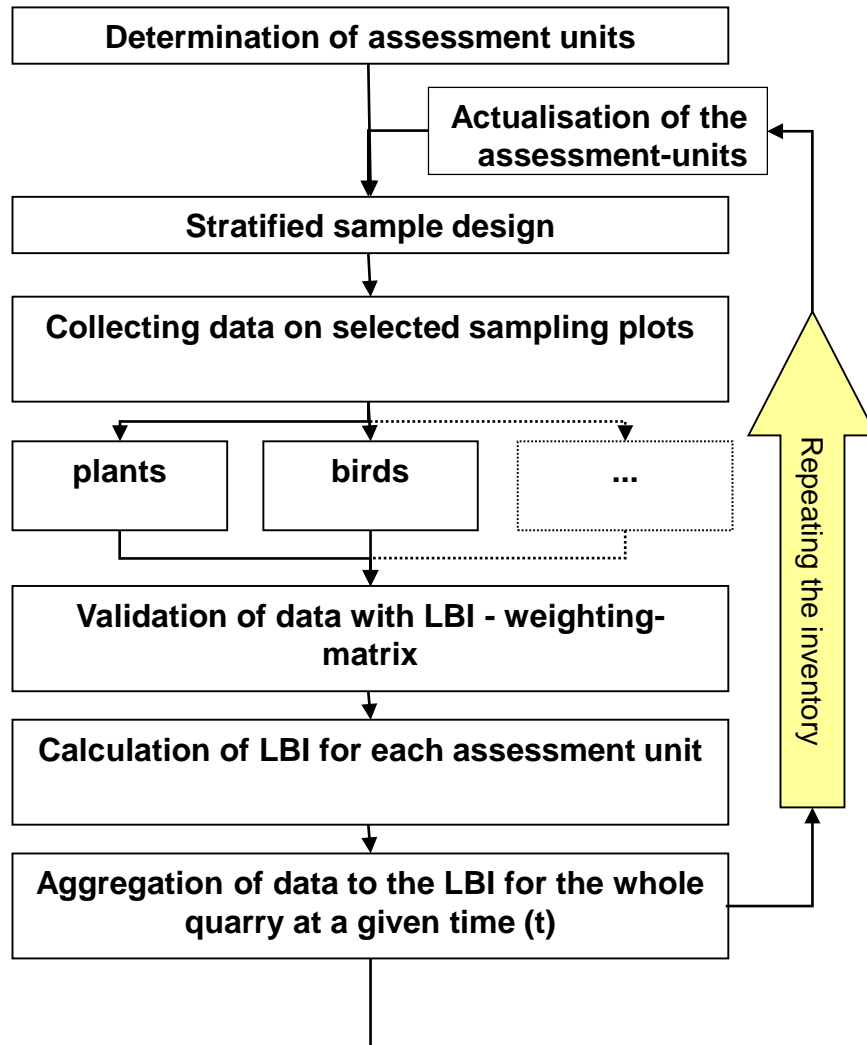


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LBI



# Repeating the inventory periodically leads to a monitoring system





# The LBI can be calculated for several different indicator groups

The  $LBI_{total(t)}$  is the calculated arithmetic mean of the results of all selected indicator groups (plants, birds, ...).

$$LBI_{ig-i} = \frac{LBI_{akt-ig-i}}{LBI_{pot-ig-i}}$$

$$LBI_{total(t)} = \frac{\sum_{i=1-n} LBI_{ig-i}}{n}$$

$LBI_{total(t)}$  = relative LBI for the whole quarry at a given time (t)

$LBI_{ig-i}$  = relative LBI for the whole quarry based on the assessment of one single indicator group (i)

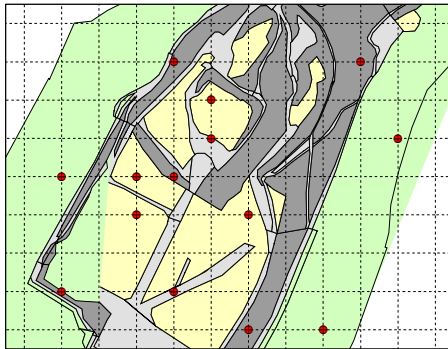
$LBI_{akt-ig-i}$  = aktual LBI based on the assessment of one single indicator group (i)

$LBI_{pot-ig-i}$  = potential LBI based on the assessment of one single indicator group (i)

$n$  = number of indicator groups

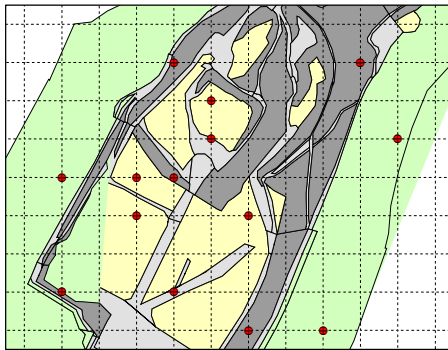


# The LBI indicates different ways of optimising biodiversity



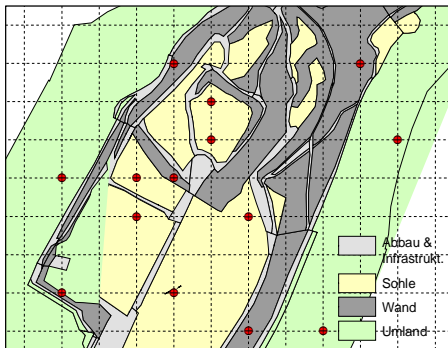
Actual State

**LBI<sub>total</sub> = 84%**



Szenario 1  
habitat improvement

**LBI<sub>total</sub> = 102%**



Szenario 2  
Reduction of area  
used for infrastructure

**LBI<sub>total</sub> = 103%**

• Stichprobenpunkt  
----- Stichprobenraster 100x100m

Assessment unit	LBI plants	LBI birds	Shared area
Level	116%	104%	35%
Wall	158%	104%	35%
Minig & infrastr.	0%	0%	30%

Assessment unit	LBI plants	LBI birds	Shared area
Level	<b>138%</b>	<b>150%</b>	35%
Wall	<b>169%</b>	<b>123%</b>	35%
Minig & infrastr.	0%	0%	30%

Assessment unit	LBI plants	LBI birds	Shared area
Level	116%	104%	<b>40%</b>
Wall	158%	104%	<b>45%</b>
Minig & infrastr.	0%	0%	<b>15%</b>

# „No recultivation is the best recultivation“

- Residual materials usually deposited in landfills
- Potential to create versatile valuable habitats
- Saving cost and create extra values



# Habitats for amphibians





# Habitats for reptiles





# Herpetofauna

## Amphibians

Scientific name	RL Status	FFH	Counts	juv
<b>Salamandra salamandra</b>	Endangered		3	
<b>Ichtyosaura alpestris</b>	Regionally / endangered in low lying areas		17	
<b>Bombina variegata</b>	Endangered	II, IV	44	Yes
<b>Bufo bufo</b>	Endangered		35	Yes
<b>Rana temporaria</b>	Regionally / endangered in low lying areas	V	14	Yes
<b>Rana dalmatina</b>	Endangered	IV	3	

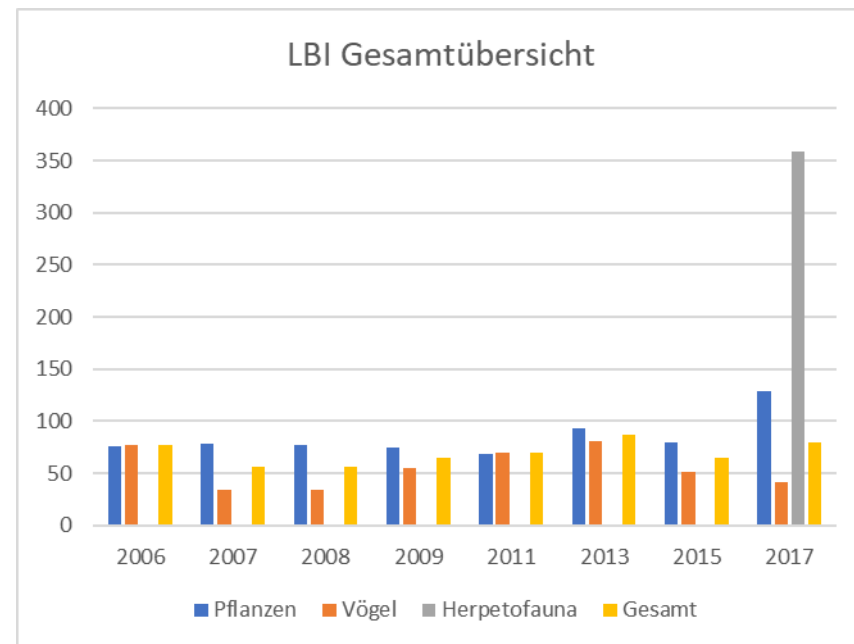
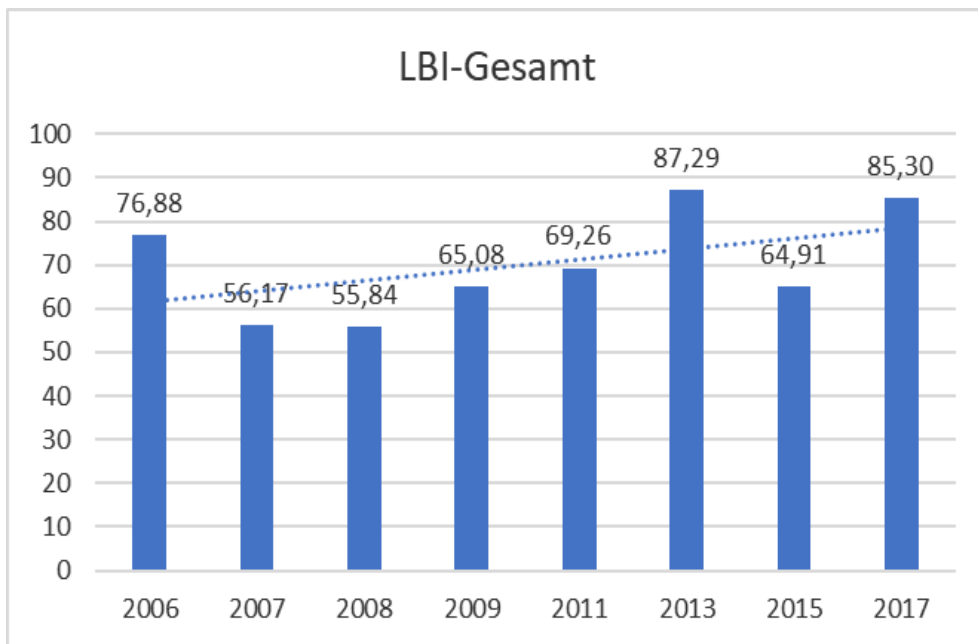
## Reptiles

Scientific name	RL Status	FFH	Counts	juv
<b>Podarcis muralis</b>	near-threatened	IV	86	Yes
<b>Lacerta viridis</b>	Critically endangered	IV	5	
<b>Natrix natrix</b>	Critically endangered		11	Yes
<b>Zamenis longissimus</b>	Endangered	IV	1	



# LBI

■ LBI – Vascular plants:	129,08 %
■ LBI - Birds:	41,60 %
■ <b>LBI - Overall:</b>	<b>80,29 %</b>
■ LBI - Herpetofauna:	358,86 %



# Pains

- Uncertainty for companies with legal obligations to recultivate
- Bad image and public opinion
- Difficulties for permission of new quarries
- Method for evaluation of of recultivation efforts



# Benefits

## Company

- Internal documentation and basis for management-measures
- Basis for planing and legal procedures
- Evidence of particular precaution (Joker for authorities)
- Public relations

## General

- Potential to improve success in approval procedures for new quarries
- Potential for standardised comparrison of different sites
- Potential to record and proof the performance of company or industry
- Gain of knowledge, awareness rising, image



Recultivation project with students

[www.e-c-o.at](http://www.e-c-o.at)



# How can the biodiversity assessment be designed to fit the needs of mining?

Requirement:

- „Proper but simple“
- Transferable, potential to aggregate
- Long-term significance (whole mining process)
- Possibility for individual adaptation
- Moderate costs

Solution:

- Index based on indicators (red listed species)
- Standardized sampling and calculating data
- Standardized quarry units

# WP3: Implementation of the LBI

- 3-4 test sites
- Different mineral extraction types
- Involve local experts for different species groups
- Before and after implementation of best practice strategies
- Indicators
  - highly significant in terms of relevant parameters
  - easy to assess
  - relevant in terms of nature conservation (national and international)



# Challenges and chances

■ UAV-technology

■ Mobile devices





# MAP & GO

