



# INDICATORS FOR CLIMATE INDUCED CHANGES IN THE LAKE BAIKAL ECOSYSTEM

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Issues in the Lake Baikal Region

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# Introduction

- management of the Baikal region is necessary
- necessary basis: information/data about the area to be managed
- choice of suitable indicators for climate induced ecosystem state changes
- In our case: Chlorophyll concentration of the lake → represents the amount of phytoplankton

# Why Phytoplankton measurements?

- Chlorophyll content is a promising indicator → link between climatic factors and ecological situation
  - measurement relatively easy and cheap
  - Phytoplankton is the lowest trophic level in the food web → changes on that level will also affect the higher trophic level species
  - quick response to environmental state changes (climatic changes, anthropogenic impact, etc.) due to oligotrophic state
- Good indicator of the condition of the lake

# Climate change and Lake Baikal

- average air temperature rise by 1.2 °C over past 60 years
  - IPCC: especially in winter higher temperatures and more precipitation expected → increased snow cover
  - changes in ice duration, thickness and transparency
  - changes in mixing behaviour of the lake due to altered temperature and wind dynamics
  - increased nutrient input to the lake due to melting permafrost
- All these factors endanger the sensitive aquatic ecosystem of Lake Baikal

# Objective

- Assessment of possible ecosystem changes due to changed phytoplankton concentrations and growth rates in the lake
- Identification of ecosystemar changes due to climate change induced effects on the Lake Baikal region (ice cover, permafrost, etc.)
- Examination of the sensitivity of Lake Baikal chlorophyll content towards changes in climatic conditions

# Method

## Spectrophotometric method:

- Principle: determination of chlorophyll content by measuring light transmittance of samples at different wavelengths
- Measurements possible also in great depths (> 250 meters)
- Problems: analysis is time-consuming; high inaccuracy (up to 20 %)
- But: very long observation period (65 years → the systematic error can be neglected) + method more convenient
- comparison of chlorophyll data with meteorological data



# Analysis

Correlation of chlorophyll concentrations with climatic factors like:

- air and water temperature
- solar radiation
- wind direction and speed (upwelling effect)
- results can provide information about expected climate induced ecosystemar changes in the aquatic food web

# Problems

Chlorophyll (Phytoplankton) concentration depends also on factors like:

- anthropogenic pollution (nutrients, chemicals)
- nutrient availability
- abundance of predators

→ The chlorophyll concentration alone is probably not sufficient as an indicator for the state of the ecosystem in terms of climate change

# Conclusion

- Threat of climate change
- Need for additional indicators and research to achieve proper management
- Necessity of a proper management with a solid funding and the institutional infrastructure for additional research
- **Without these necessary measures the stability of the ecosystem of Lake Baikal, its biodiversity and its unique beauty are endangered!**



THANK YOU FOR YOUR INTEREST!

QUESTIONS?