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Preventive methods against biodeterioration of protected building materials

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Background

- Occurrence and extension of biodeterioration in wooden materials on Svalbard has earlier been poorly examined and reported.
- This lack of knowledge has influenced on understanding and handling of listed buildings and building materials.
- Our work with focus on biodeterioration on listed buildings since 2002 have given new facts and updated knowledge in this topics. This can improve the future work with cultural heritage on Svalbard.

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Field and laboratory experience 2002-2009

- Through the years, about 125 buildings and building remains have been examined by various degree of building survey.
 - Climatically exposure have been estimated
 - Visible damages were recorded
 - Moisture measurements were performed
 - Sampling of decayed wood and moulded surfaces for analysis.
- In all, 191 wooden samples and 171 tape lifts has been sampled. Furthermore, 178 air samples has been taken from outdoor and indoor air.
- The results are in process for publishing.

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Understanding damages

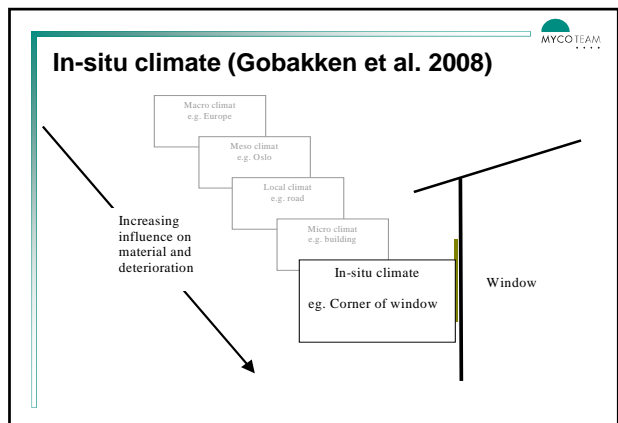
- Established damages is a result of long term exposure.
- Future damages is by that reason predictable.
- Thorough building survey is necessary to:
 - identify and evaluate established damages.
 - identifying the need for repair.
 - evaluate the risk for future decay.
- Climate change and change in use can influence on the development damages.



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Established damages – information source

- How can the micro-climate be understood and explained?
- What exposure has it been?
 - Observations
 - Measurements
 - Long-term measurements - logging
- What is the future exposure?
 - If there are no changes
 - If the microclimate is altered
- What is the minimum needed change for avoiding further damage?



Microclimatic zones – In-situ climate (Svalbard)

1. Permafrost (no temperature/no water)
2. Thaw zone (low t/high w)
3. Soil contact, RH (moderate t/high w)
4. RH, precipitation (high t/high w)
5. RH, leakage (moderate t/low w)




Practical implications with building survey in listed buildings on Svalbard

- Limitations in access due to geographical aspects.
- Limited access for dismantling suspected or visible damaged constructions restricts the possibility for a thorough survey in order to find all damages. It is primarily in connection with crawl space and floor constructions where this is a major problem.
- Restricted policy for sampling (number and size of samples) limits the possibility to get a good understanding of the damages in a building.
- Lacking of understanding of the condition for the materials, constructions and buildings gives an uncertain conclusion. Management and repair work is by these reasons not in an optimal situation with respect to the future.


Difference between buildings and materials




Physical conditions

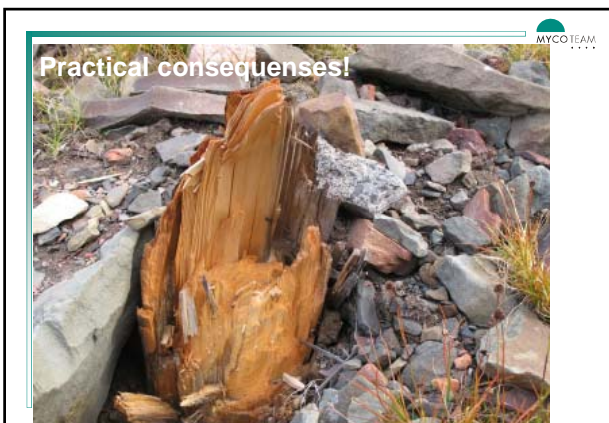


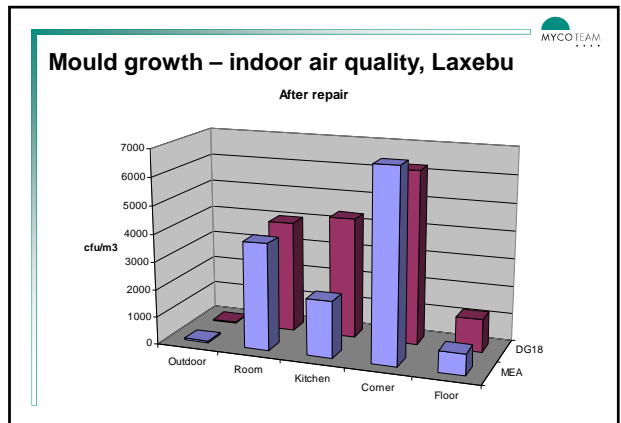
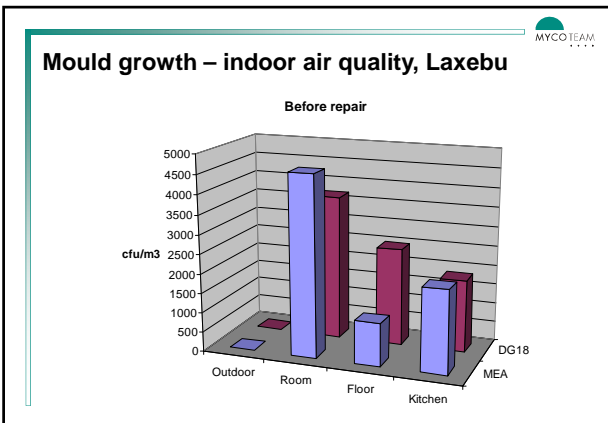
Mould growth - condensation



Mould growth - leakage



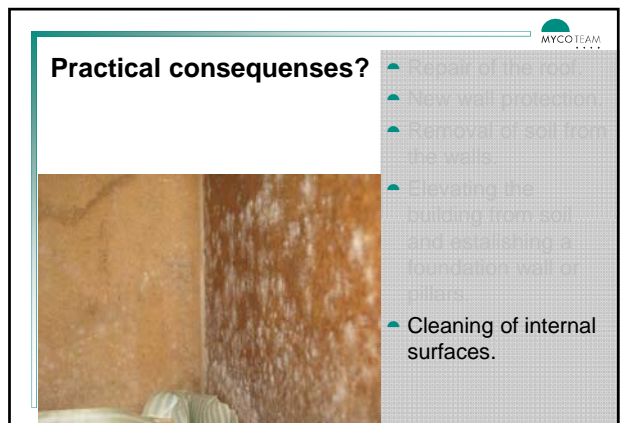
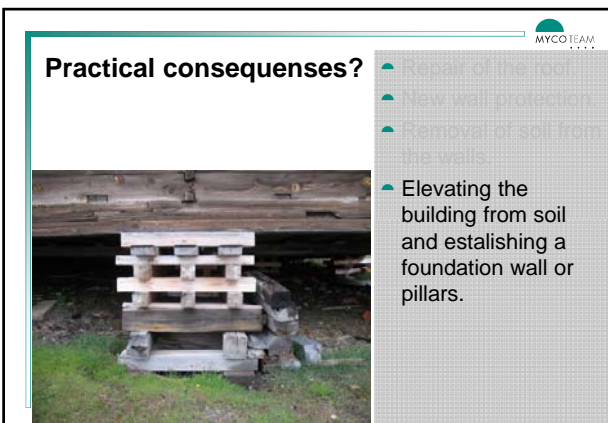






- Processual authenticity?
- Repair without improvement, replay of the damage development.
 - These damages is predictable.
 - In cases with change in use or climate change, damages can be different.
 - These damages are more unpredictable.
 - How can this be solved?

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 - How can this be solved?
 - What about a "pragmatic authenticity"?**
 - a practical approach with natural development



Practical consequences?

- ▲ ...
- ▲ ...
- ▲ ...
- ▲ ...
- ▲ ...
- ▲ ...
- ▲ Ventilation of the rooms.

Other problems and solutions?



How can new materials be handled?

- ▲ Keep them dry during production and storage.
- ▲ Disinfection (heat treatment)?
- ▲ Proper removal of decayed materials at the site before installing new wood.

Conclusions

- ▲ Mould growth and decay occurs on Svalbard.
- ▲ Damages will reappear after repair.
- ▲ Damages can be worse due to change of use and climate change.
- ▲ Improvement of constructions, if accepted, can reduce the rate of biodeterioration and improve the IAQ.

