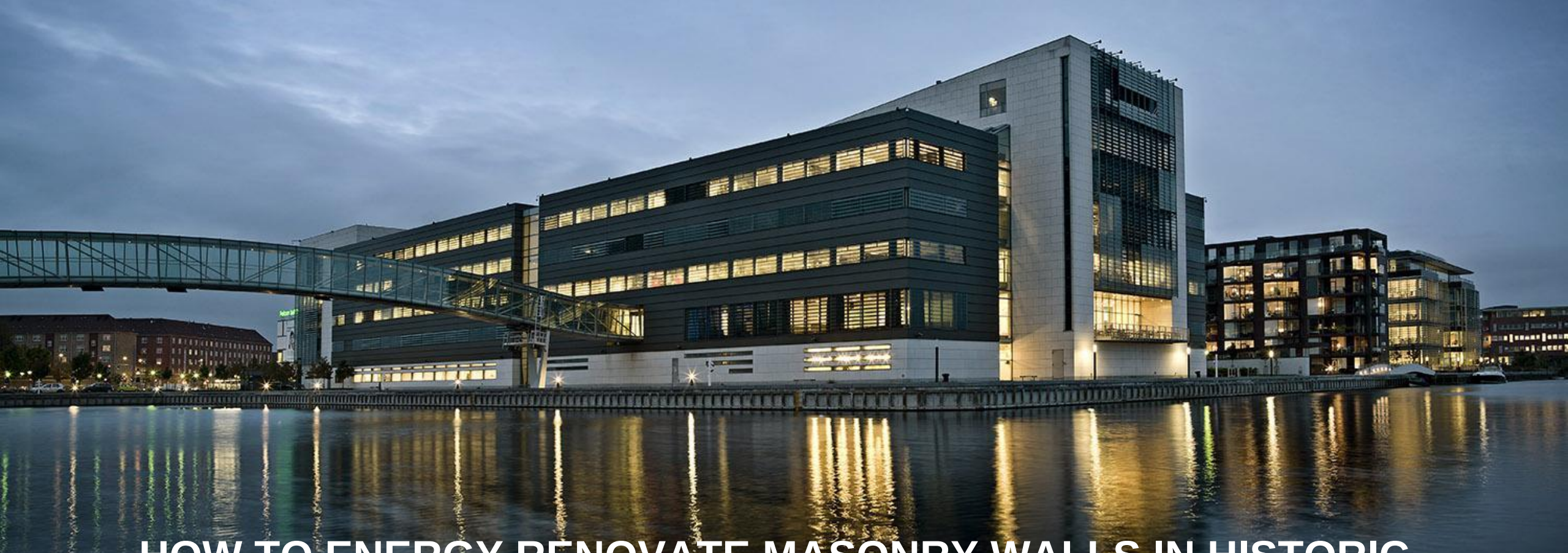

HOW TO ENERGY RENOVATE MASONRY WALLS IN HISTORIC BUILDINGS IN A MOISTURE SAFE WAY?

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Background

- No external insulation!
  - Cultural heritage, historic and aesthetic values
- Internal insulation
  - Reduces heat loss through facade
  - Improves indoor thermal comfort

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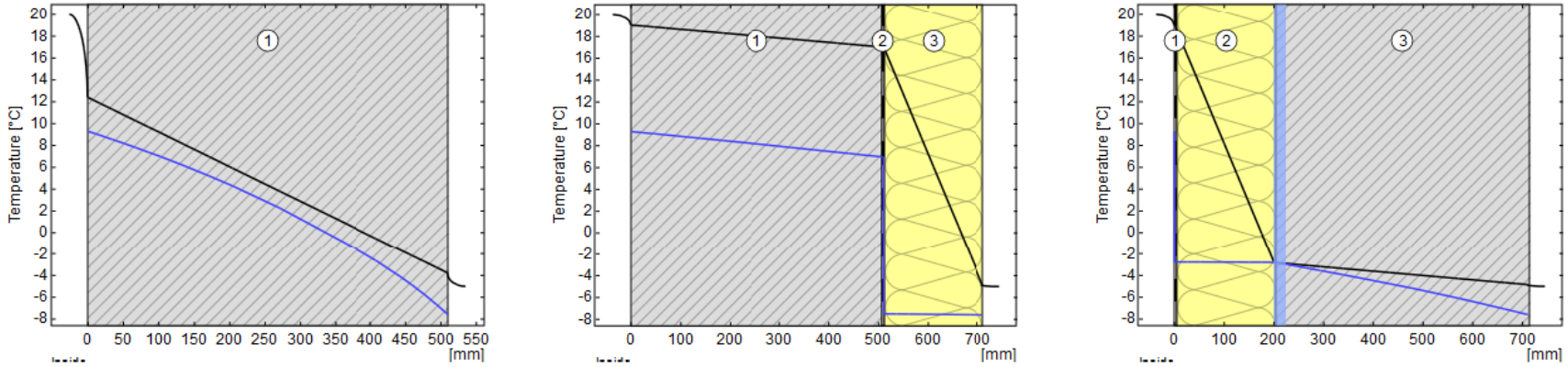
  - Improves indoor thermal comfort
  - Reduces drying potential and temperature in existing wall
  - Potential interstitial condensation and mould growth

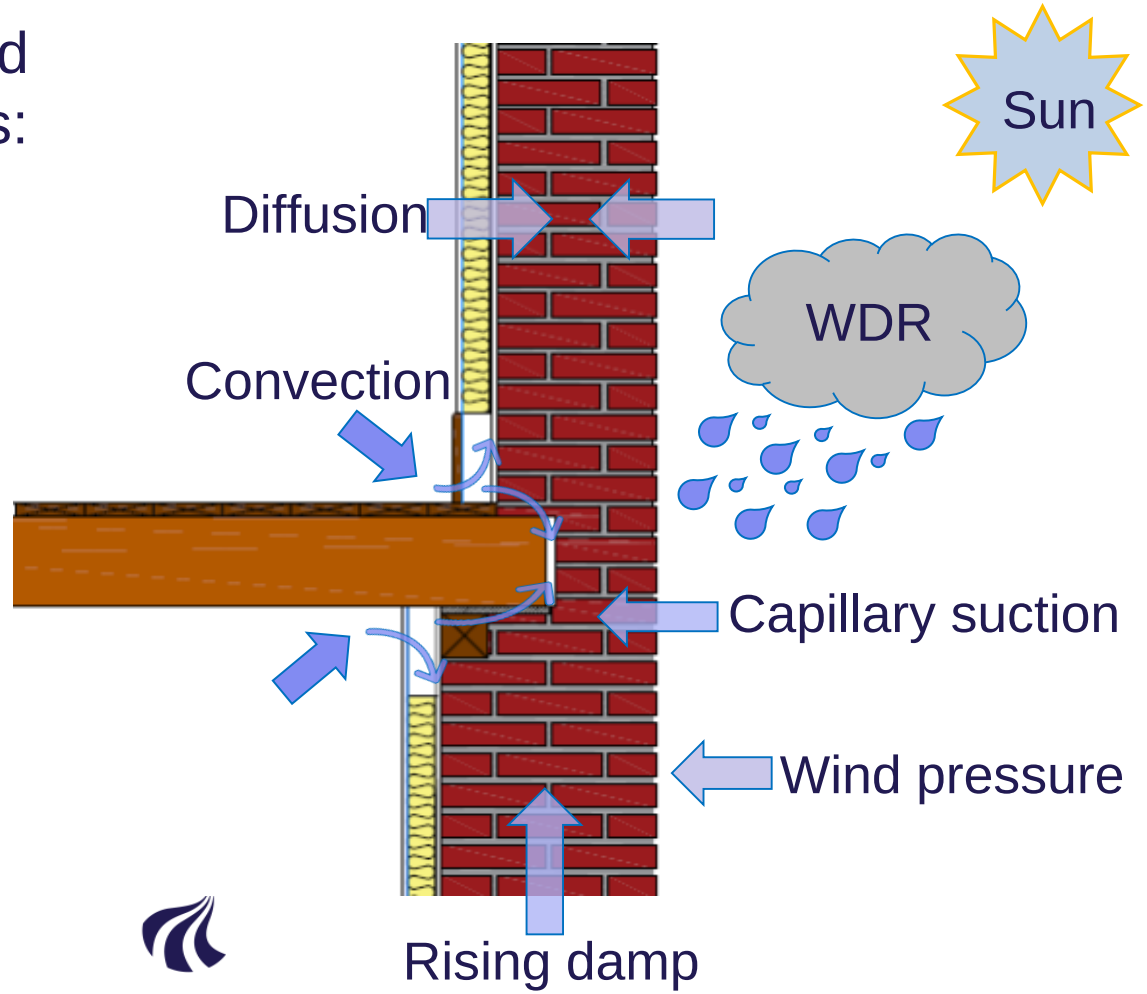


RIBuild deliverable D1.2; A. Blumberga, K. Kass, E. Kamendere, G. Zogla, A. Kamenders, D. Blumberga, et al., State of the art on historic building insulation materials and retrofit strategies, 2015. doi:10.1002/ejoc.201200111.

Background

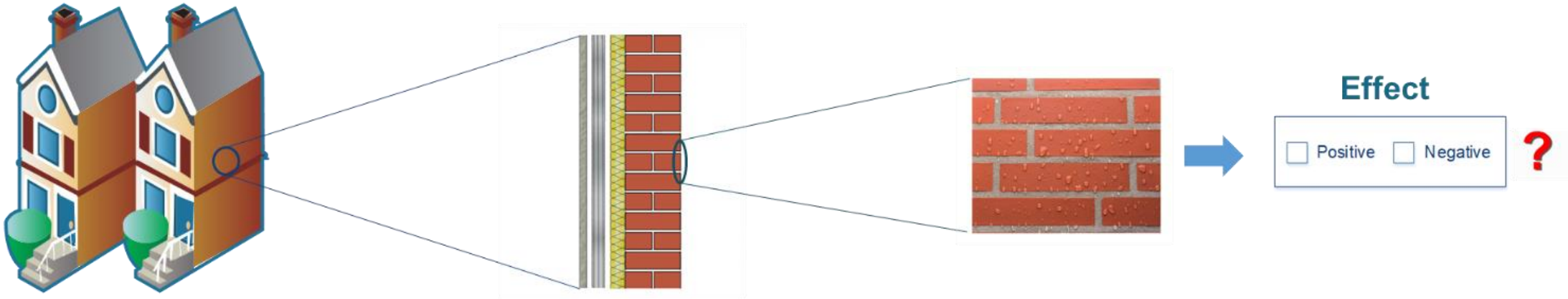
Moisture transport mechanisms and sources in internally insulated walls:

- Interior moisture loads
- Wind-driven rain
- Summer condensation
- Built-in moisture
- Rising damp



Problem statement

- Is it possible to improve thermal insulation of historic buildings **to a level of new buildings** without compromising the moisture safety?

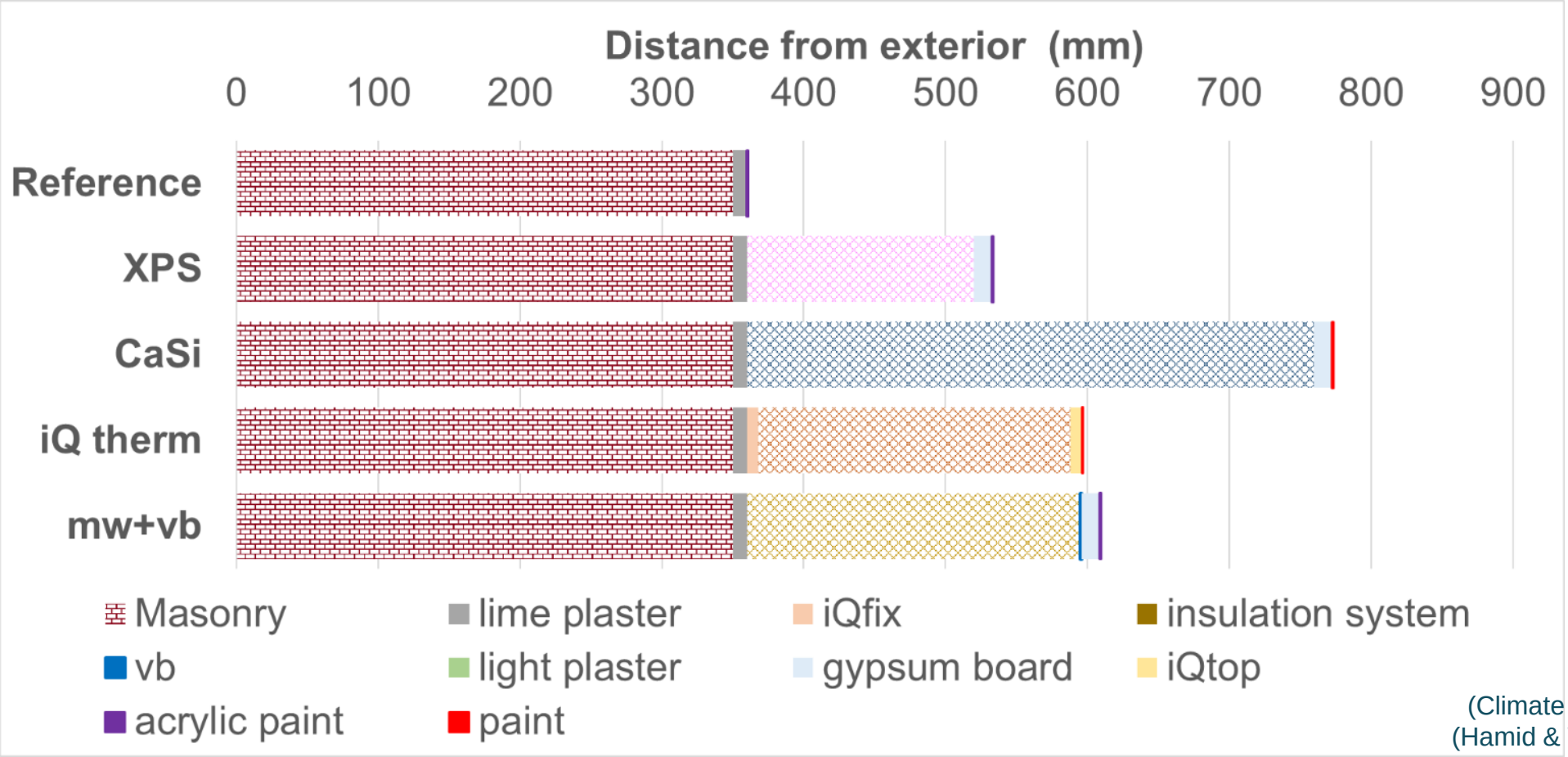


➢ **Historic buildings** ➢ **Interior Insulation** ➢ **Hydrophobization**

Case study:
Refurbisment with the change of use

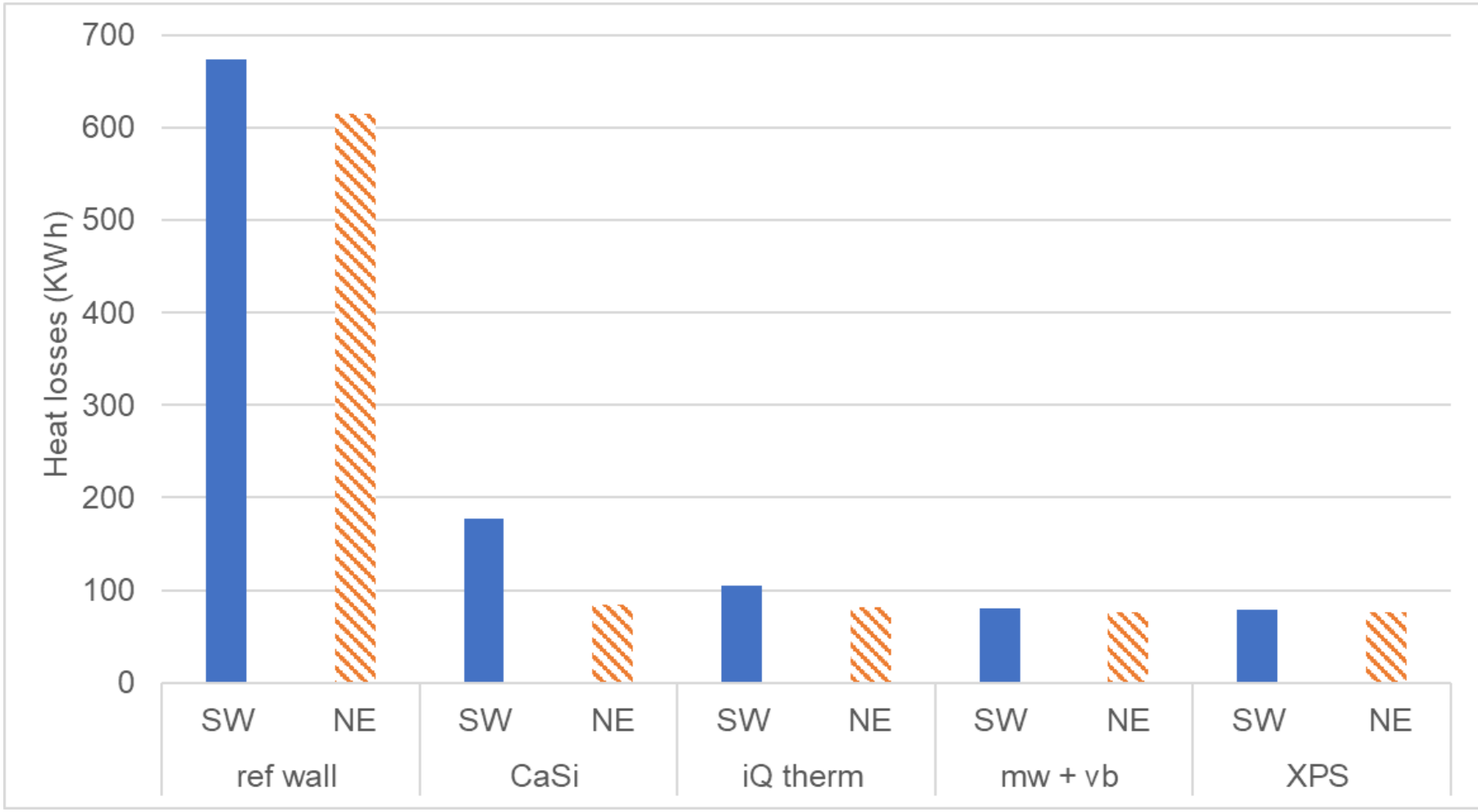
Simulation input

- Internal insulation: thickness□ **U = 0.15 W/m²K**
- Constant indoor conditions (20 °C & 50% RH)
- South-West (SW) & North-East (NE) orientation
- Oceanic climate (Taastrup, Denmark)*
- Simulation duration: 5 years
- Hydrophobization: neglect wind driven rain**

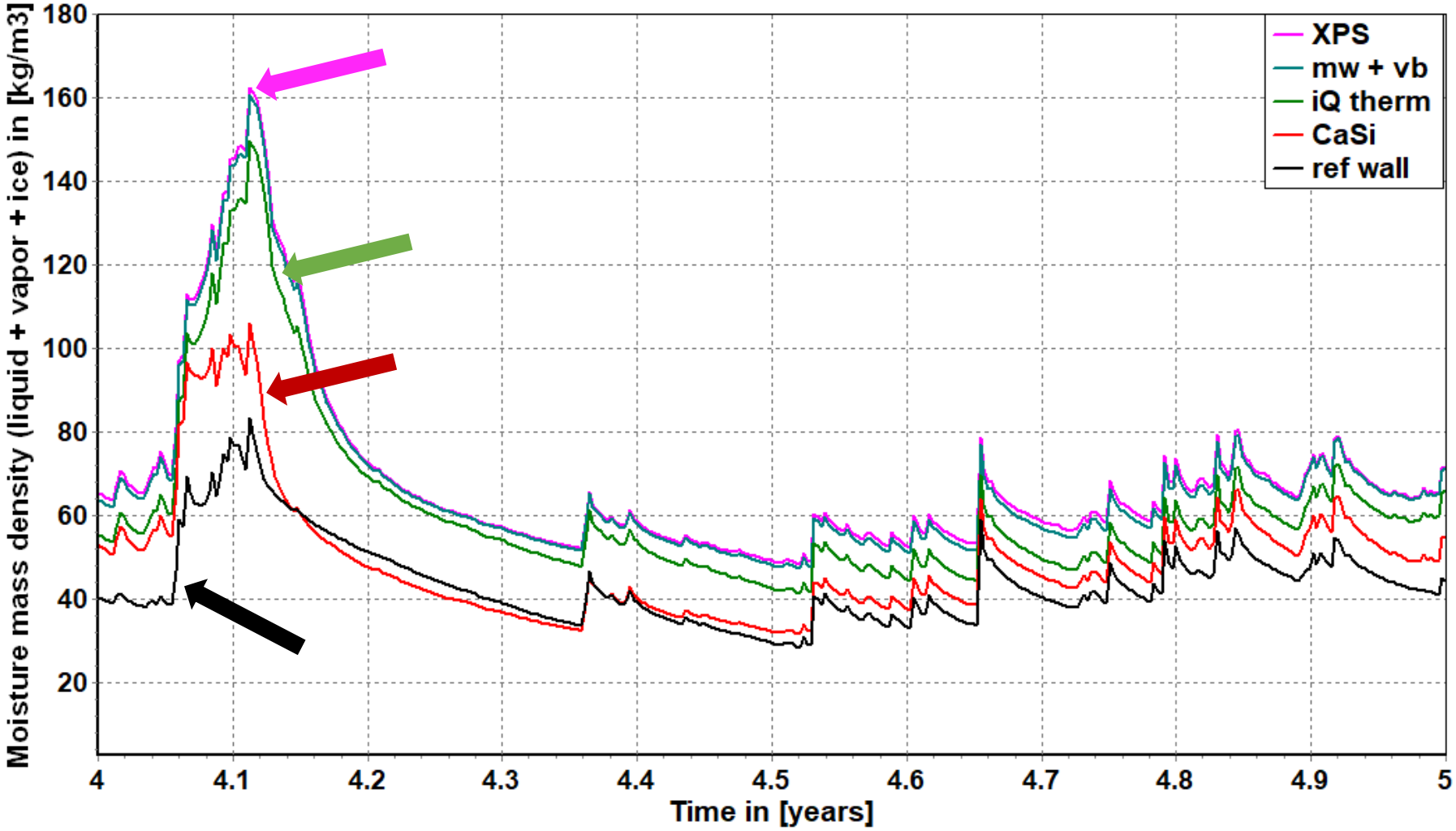


(Climate for Culture, 2009)*
(Hamid & Wallentén, 2017)**

Results: Total heat loss for 5 year of simulation (SW & NE)

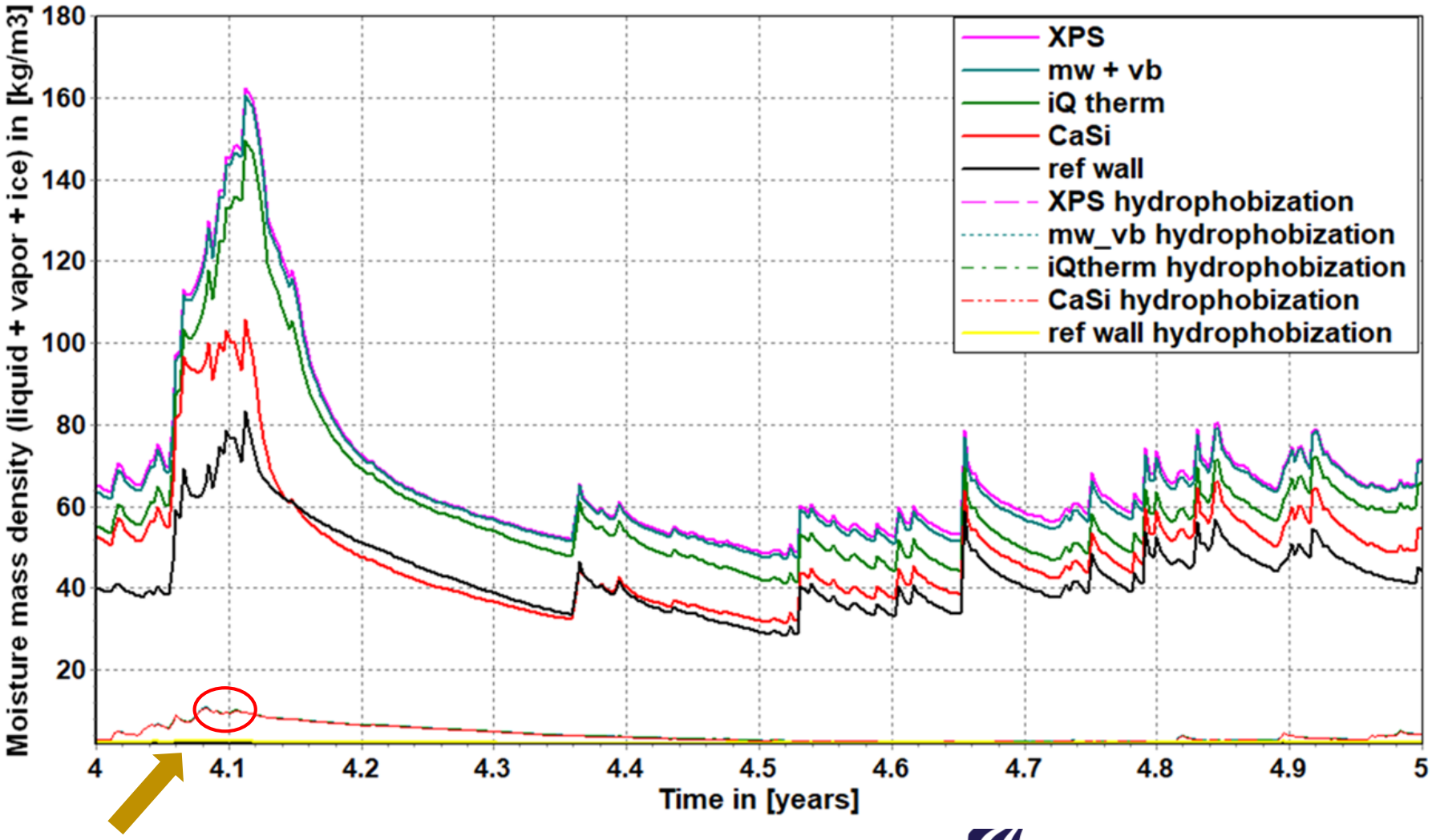


Results: Moisture content in the masonry (SW)



- Ref wall lowest moisture content but it does not dry out.
- Addition of internal insulation leads to increased moisture content.
- CaSi lower moisture content because it is capillary active.
- XPS/mw + vb highest moisture content because it is water tight.
- iQ therm slightly lower moisture content due to capillary active open channels.

Results: Effect of hydrophobization (SW)



- Hydrophobize the Ref wall leads to 0 moisture content
- Internal Insulation plus hydrophobization leads to almost 0 moisture content

Conclusions

- **Internal insulation**
  - Increases the moisture content in the masonry
  - Higher risk of moisture related damages
  - SW orientation higher risk than NW
  - Significant reduction of heat losses
- **Hydrophobic impregnation**
  - Eliminates the moisture content in the masonry and the risk of moisture damages

Thank you!

Project:
Moisture safe energy renovation of historic masonry walls

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