

Performance of wooden windows and façade elements in different natural environments

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COST ACTION FP 1303
Final conference

BUILDING WITH BIO-BASED MATERIALS: BEST PRACTICE AND PERFORMANCE SPECIFICATION



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INGENJÖRSKÄ FAKULTETEN

BIOTEHNIŠKA FAKULTETA





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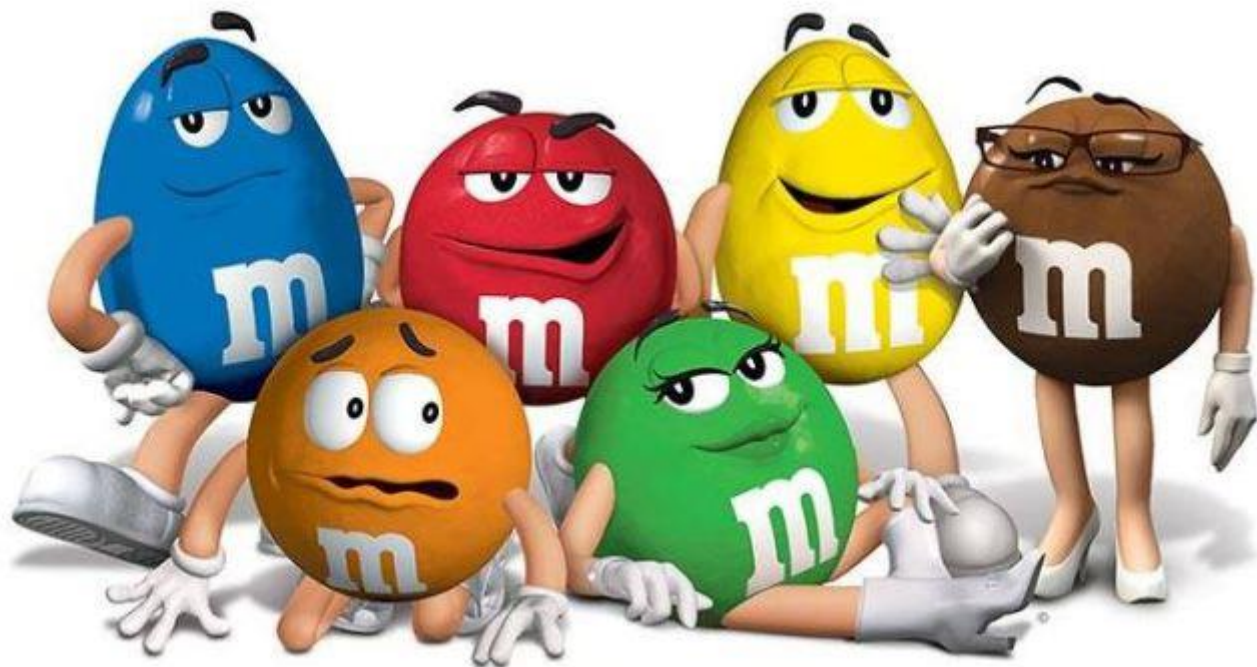


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Silvapro® Wood Thermal conductivity (λ)

$$\lambda_{larch} = 0,13 \text{ W/mK}$$
$$\lambda_{meranti} = 0,15 \text{ W/mK}$$
$$\lambda_{oak} = 0,18 \text{ W/mK}$$



Picea abies (TM)

$\lambda = 0,09 \text{ W/mK}$

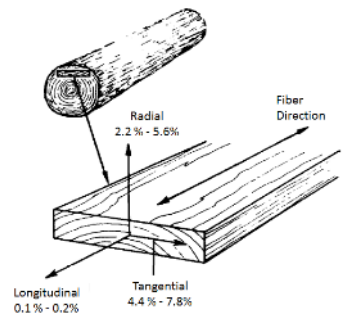
Picea abies

$\lambda = 0,11 \text{ W/mK}$

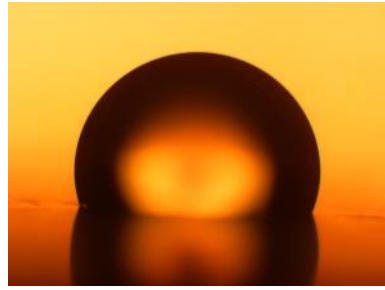
Natural durability



Dimensional stability

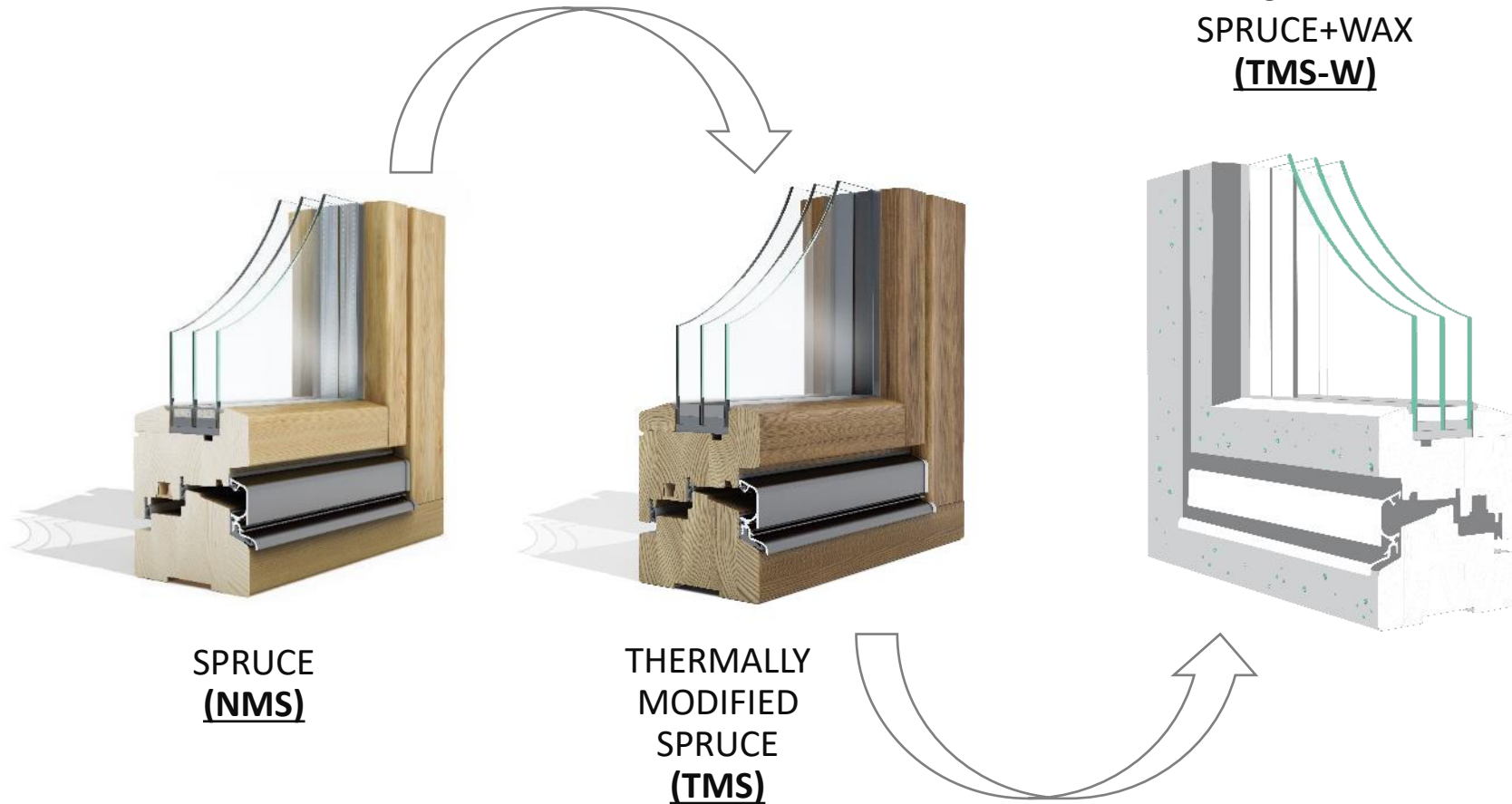


Hydrophobicity



- *Increased durability and prolonged life-time*
- *Increased thermal insulation*
- *Increased dimensional stability*

THERMALLY
MODIFIED
SPRUCE+WAX
(TMS-W)



SPRUCE
(NMS)

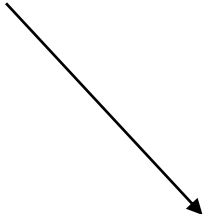
THERMALLY
MODIFIED
SPRUCE
(TMS)

Natural based coating instead of synthetic

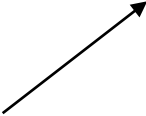
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Water emulsion of wax



Wood



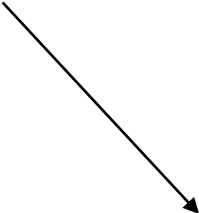
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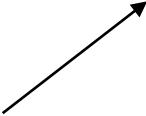




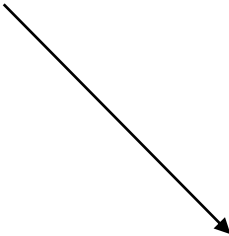
Water emulsion of wax



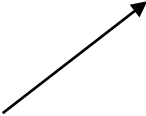
Wood



Wax after the evaporation of water out of emulsion



Wood



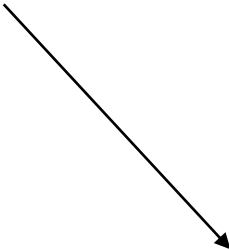


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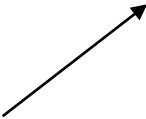
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Melted wax after the heating



Wood



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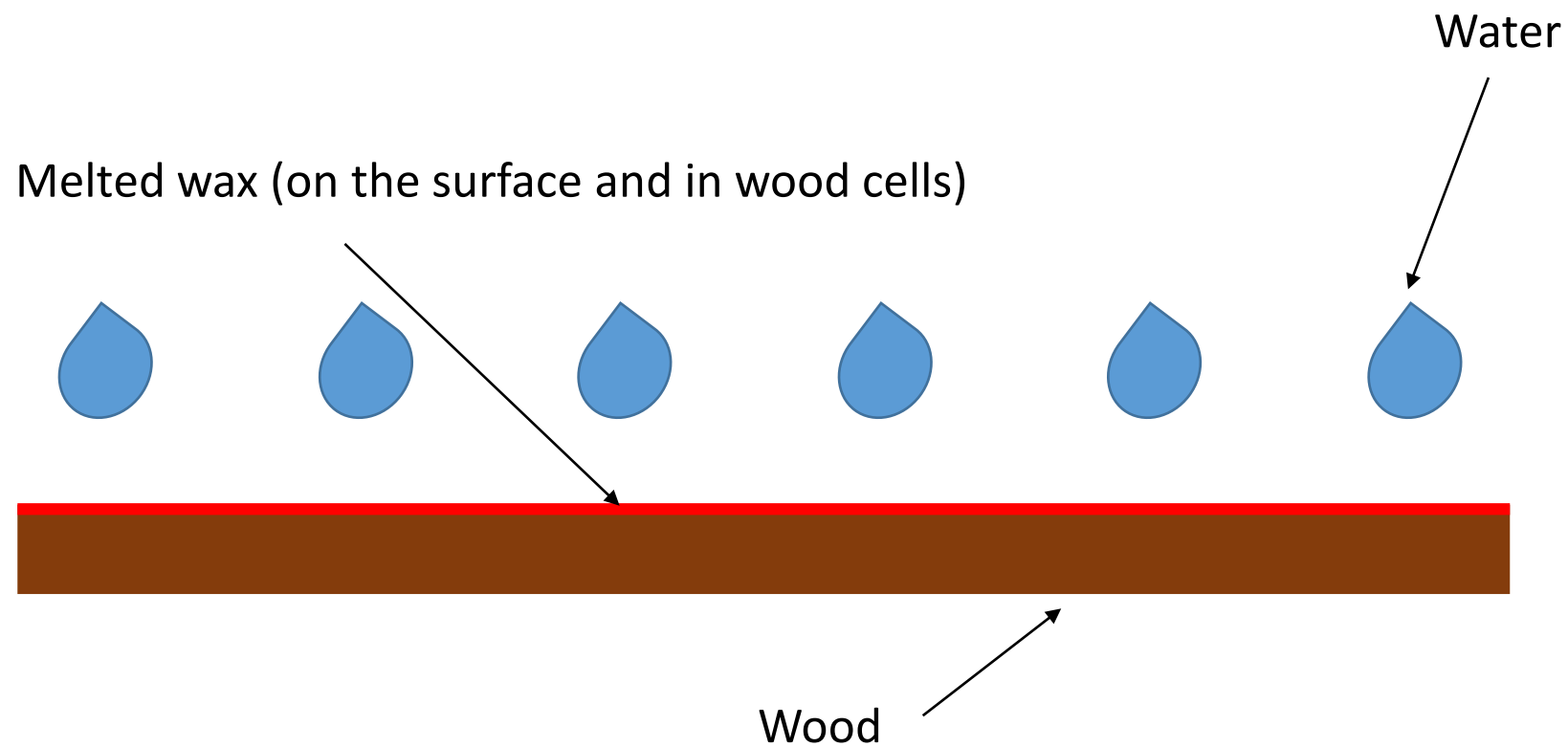
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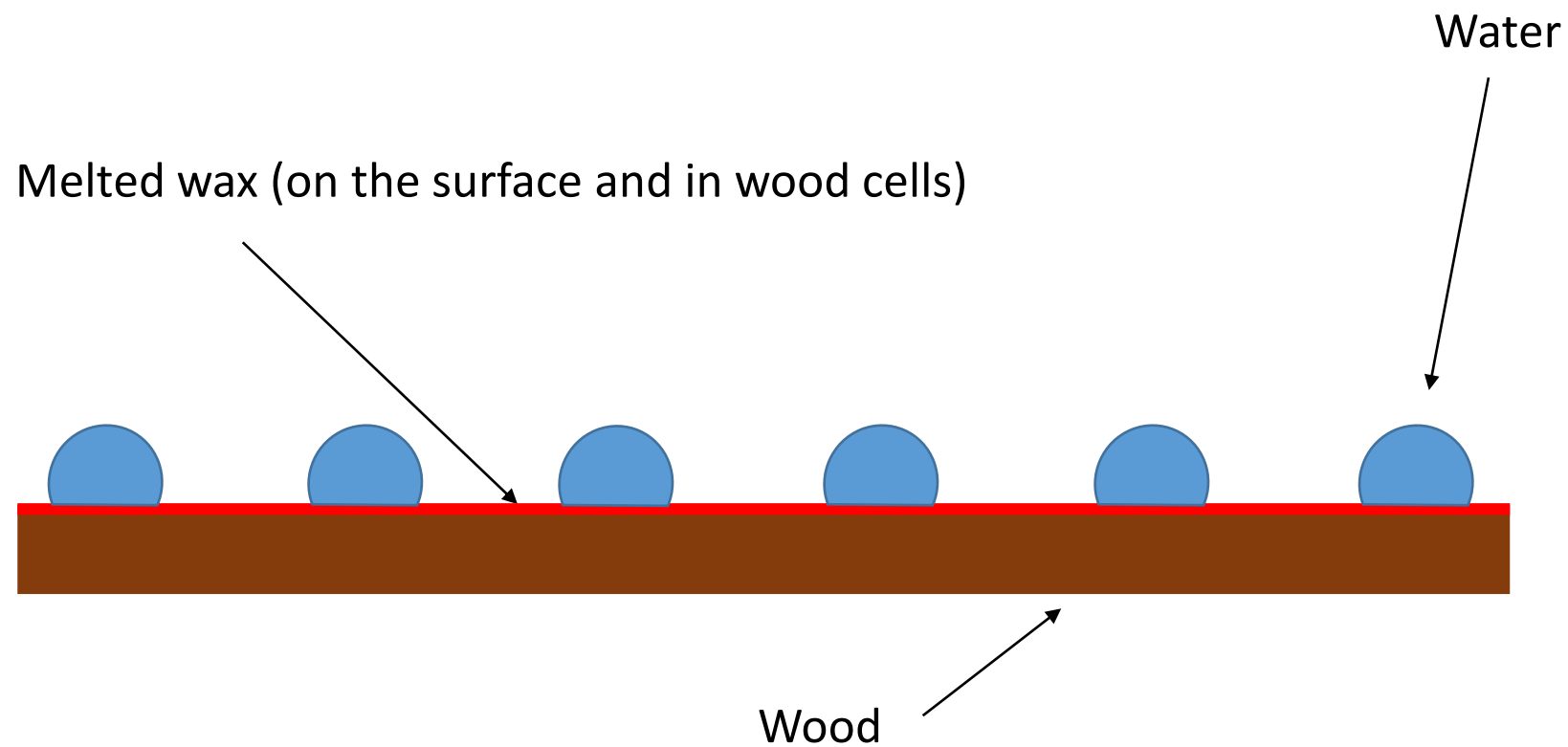
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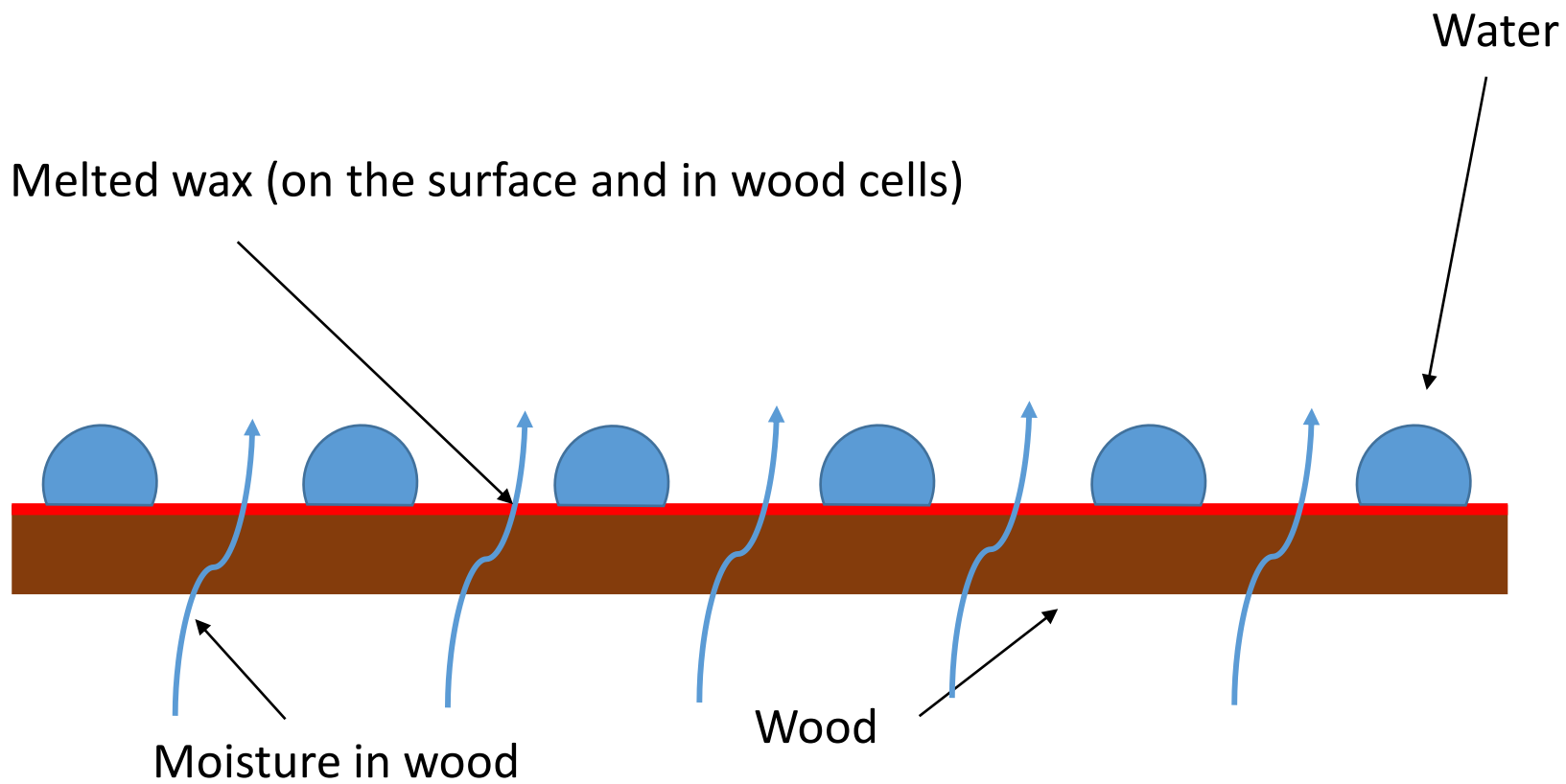
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LONG TIME SURFACE HYDROPHOBICITY



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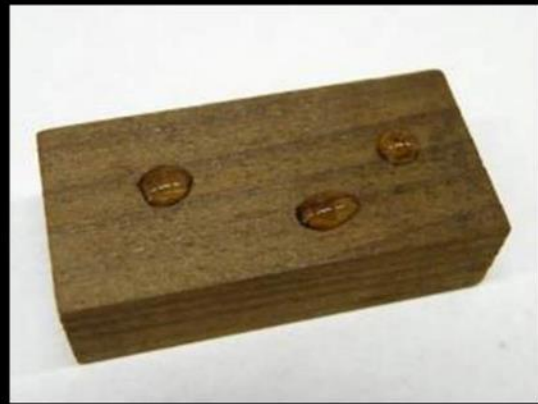
Contact angle of water drop on different surfaces

Spruce

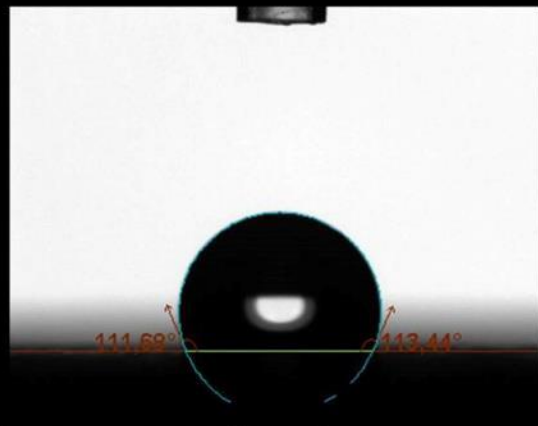
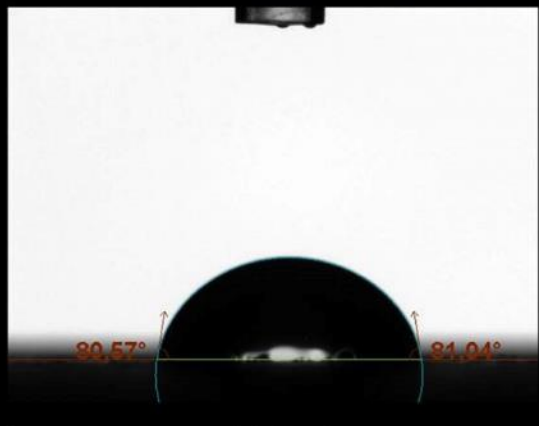
Thermally modified spruce

Thermally modified spruce + wax

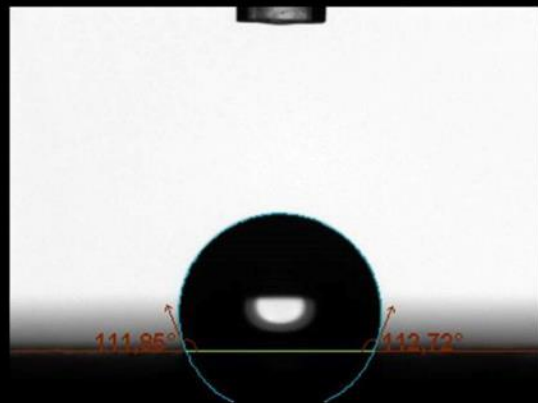
Samples



After 10 s



After 40 s









3 WINDOWS

PROFILE THICKNESS: 110 mm

WOOD:

- Spruce (NMS)
- Silvapro® thermally modified spruce (TMS)

SURFACE TREATMENT:

- synthetic coating (NMS-C, TMS-C)
- wax (NMS-W, TMS-W)
- oil

42 SETS OF FAÇADE MATERIALS

- 50 × 25 × 500 mm
- Spruce (NMS), Silvapro® thermally modified spruce (TMS), larch, beech, thermally modified beech, poplar, thermally modified poplar, pine
- SURFACE TREATMENT: wax (TMS-W), wax with pigment (TMS-WP), oil, synthetic coating (TMS-C)

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WOOD
MOISTURE
CONTENT



INSULATION
PROPERTIES



COLOUR
CHANGES



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WOOD
MOISTURE
CONTENT
(*electrical
resistance, every
12 hours*)



COLOUR
CHANGES
(*CIE L*a*b**)



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WINTHERWAX

Skellefteå



Hannover



Ljubljana
Žiri



Madrid





Žiri (Slovenia)



Ljubljana (Slovenia)



Hannover (Germany)



Skellefteå (Sweden)



Madrid (Spain)

WINTHERWAX TEST CUBES AROUND EUROPE

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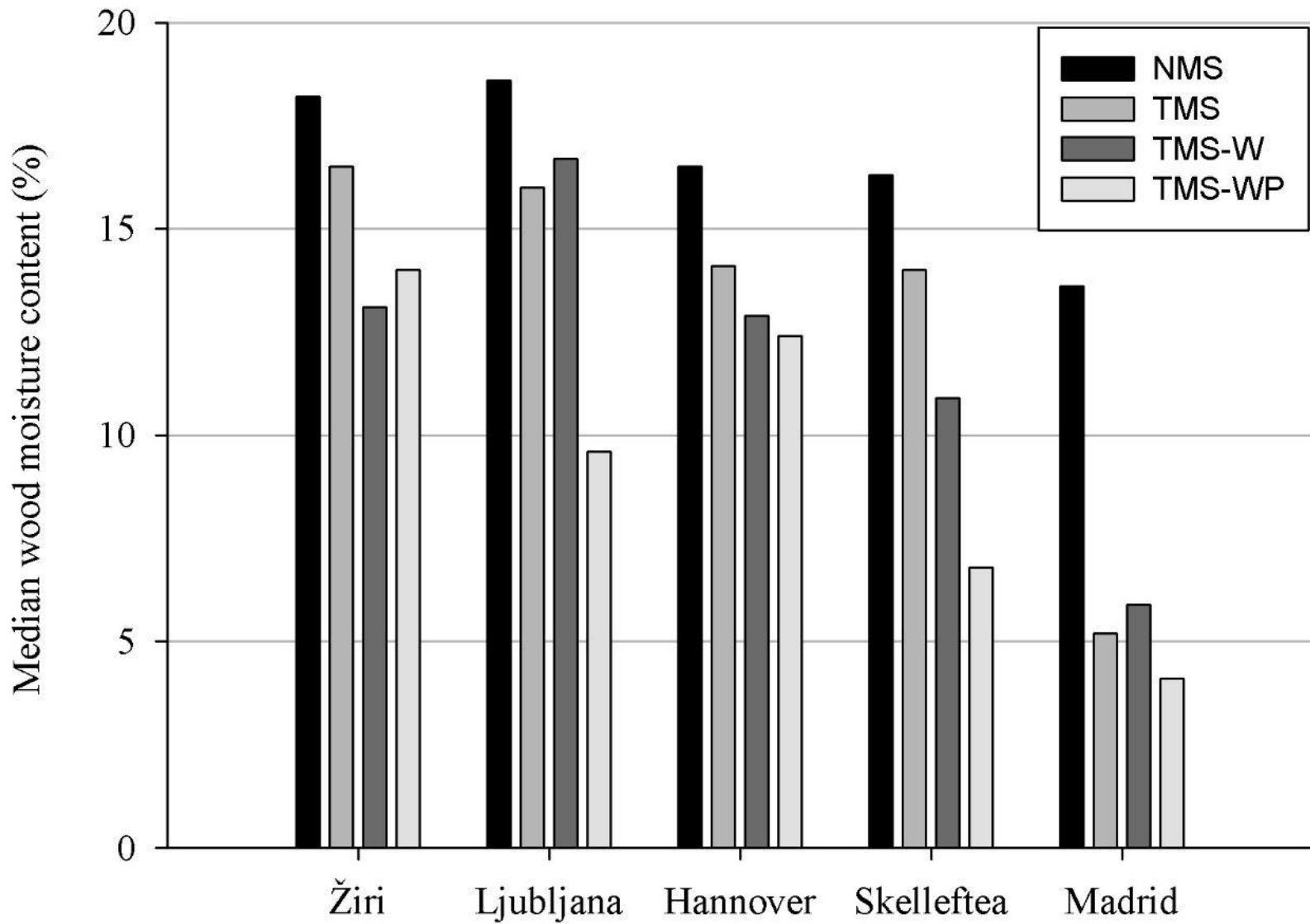
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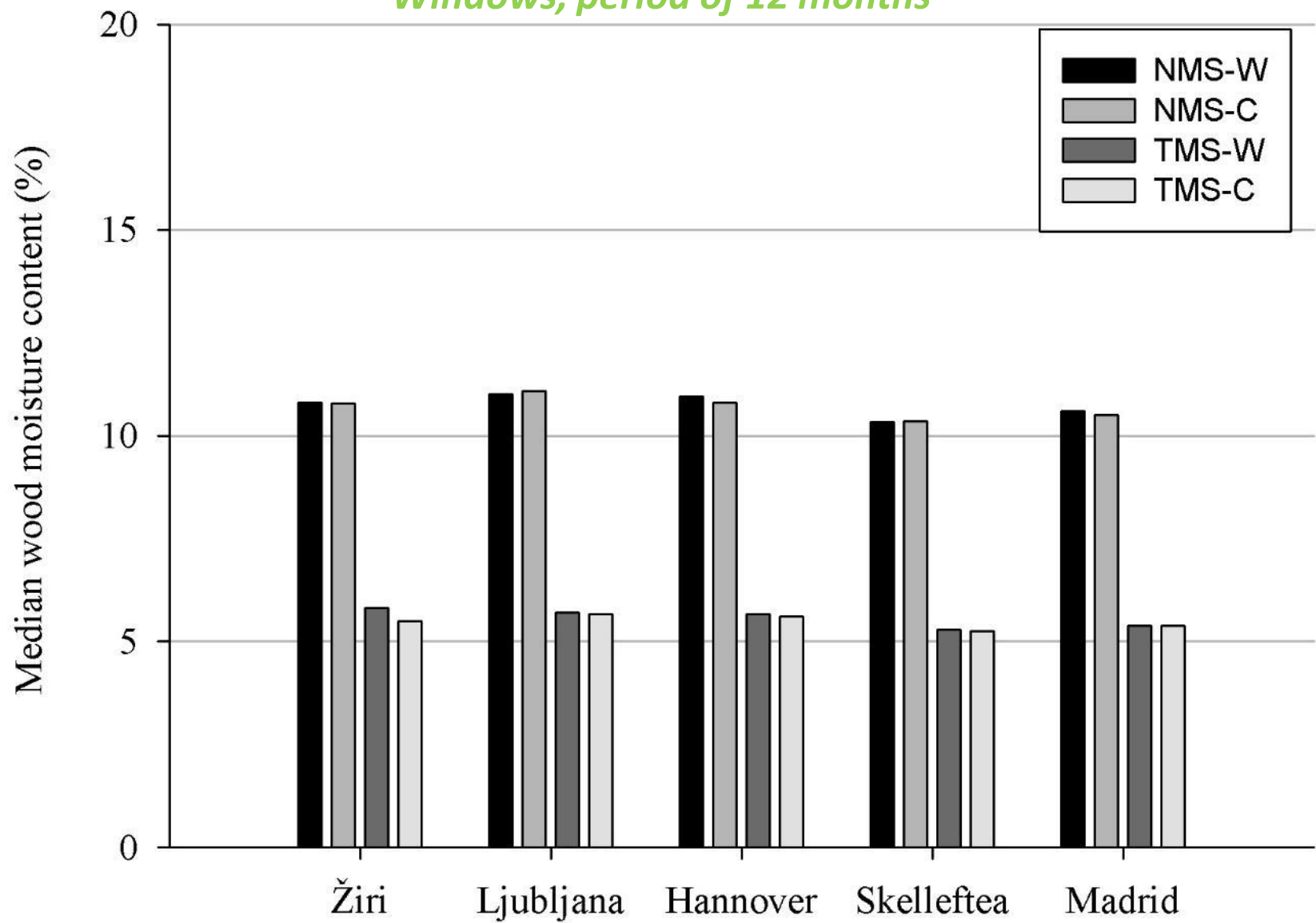
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Facade elements, period of 12 months



	Žiri	Ljubljana	Hannover	Skellefteå	Madrid
Average annual temperature [°C]	9,8	10,4	8,8	1,9	13,7
Average January temperature [°C]	0,1	-0,1	0,3	-11,0	5,0
Average July temperature [°C]	19,4	20,4	17,1	15,5	24,0
Annual precipitation [mm]	1271	1290	666	559	450
Relative Scheffer Climate Index [-]	1,17	1,44	1,44	0,67	0,61
Relative dose [-]	2,03	2,42	1,75	0,63	0,65

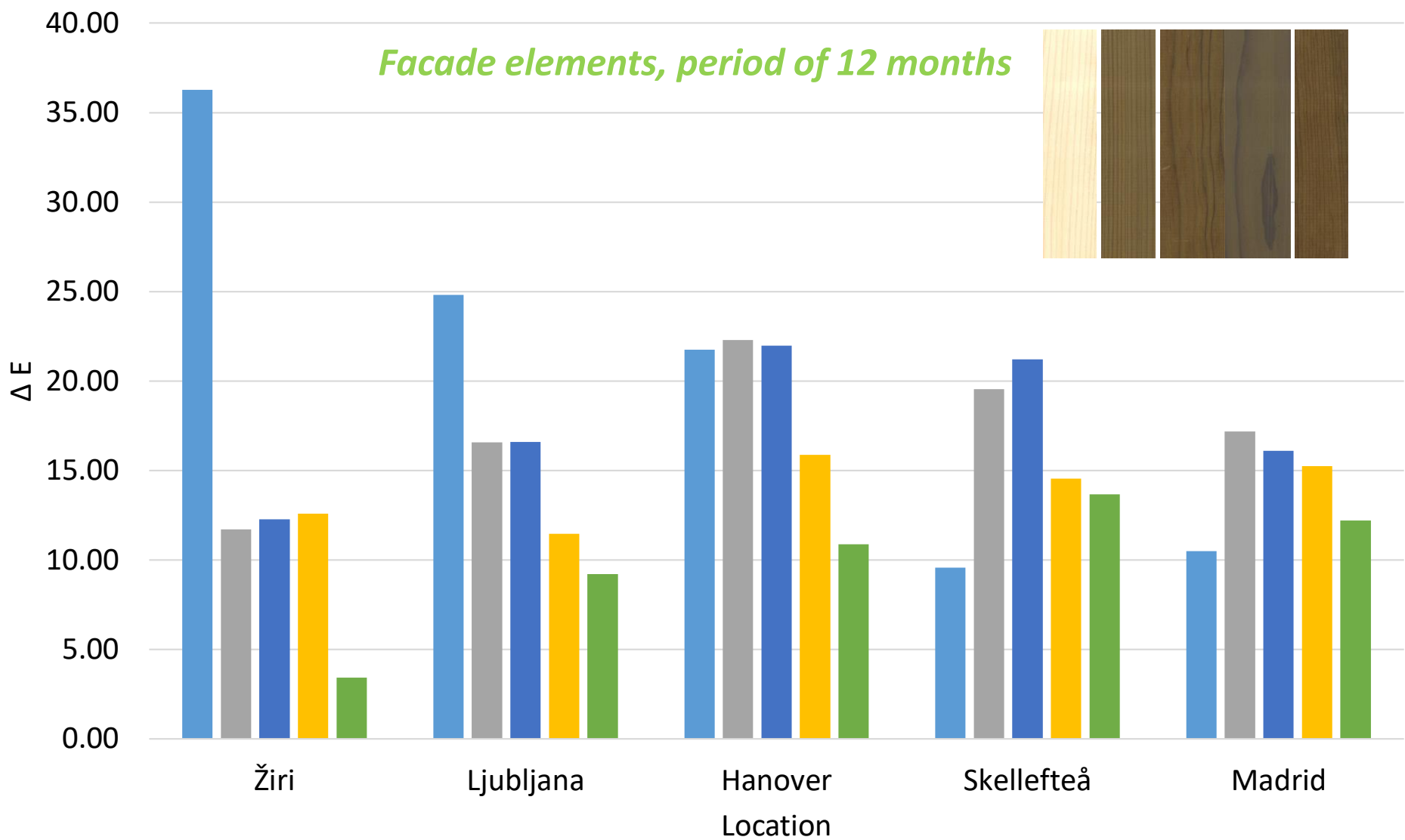
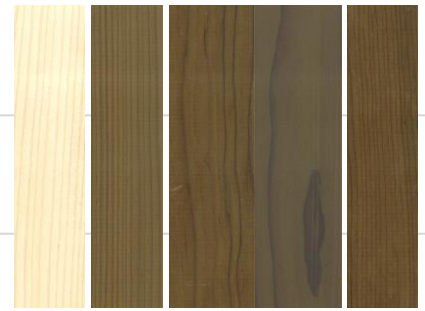
Windows, period of 12 months



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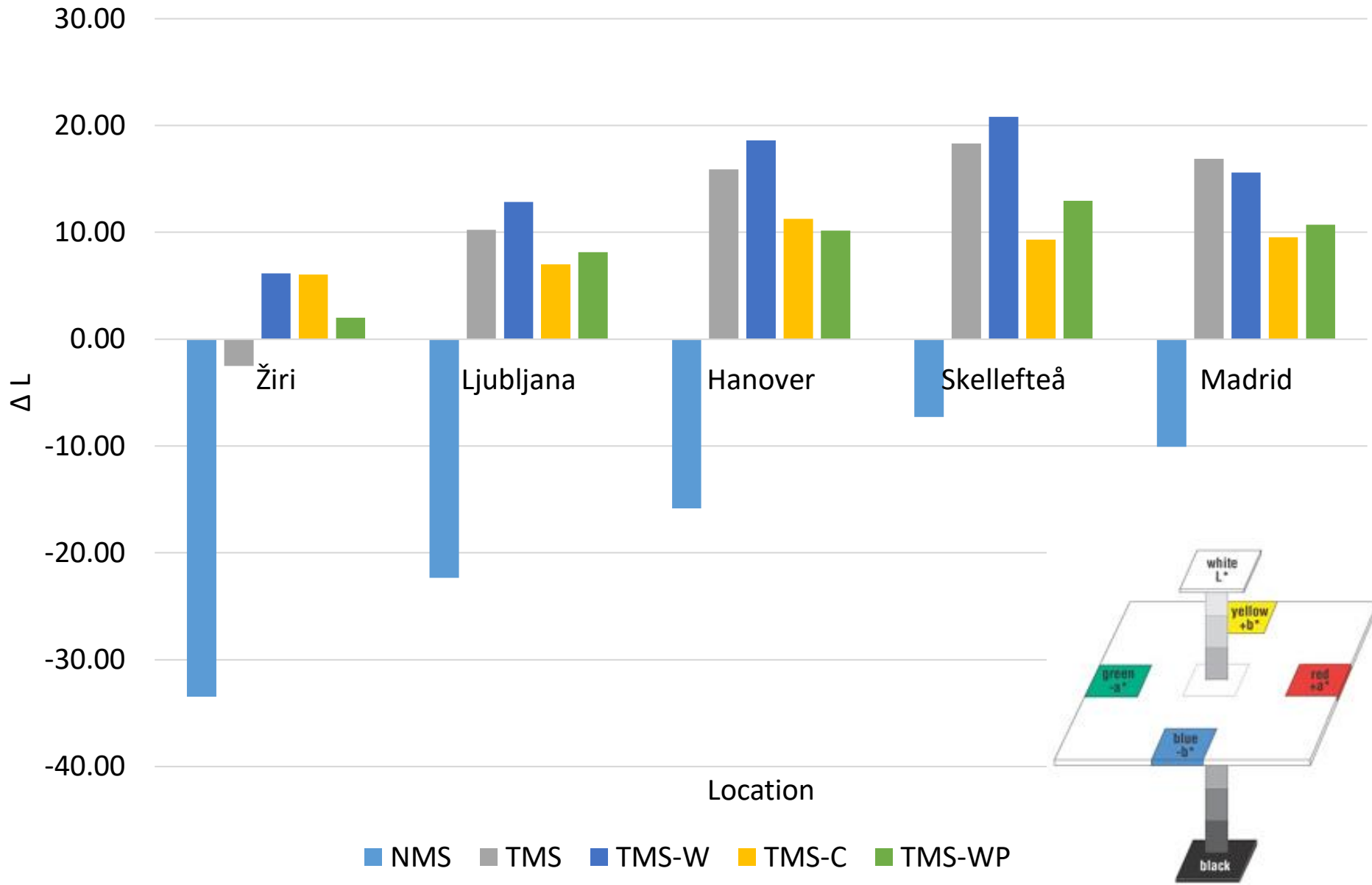
Facade elements, period of 12 months



■ NMS ■ TMS ■ TMS-W ■ TMS-C ■ TMS-WP

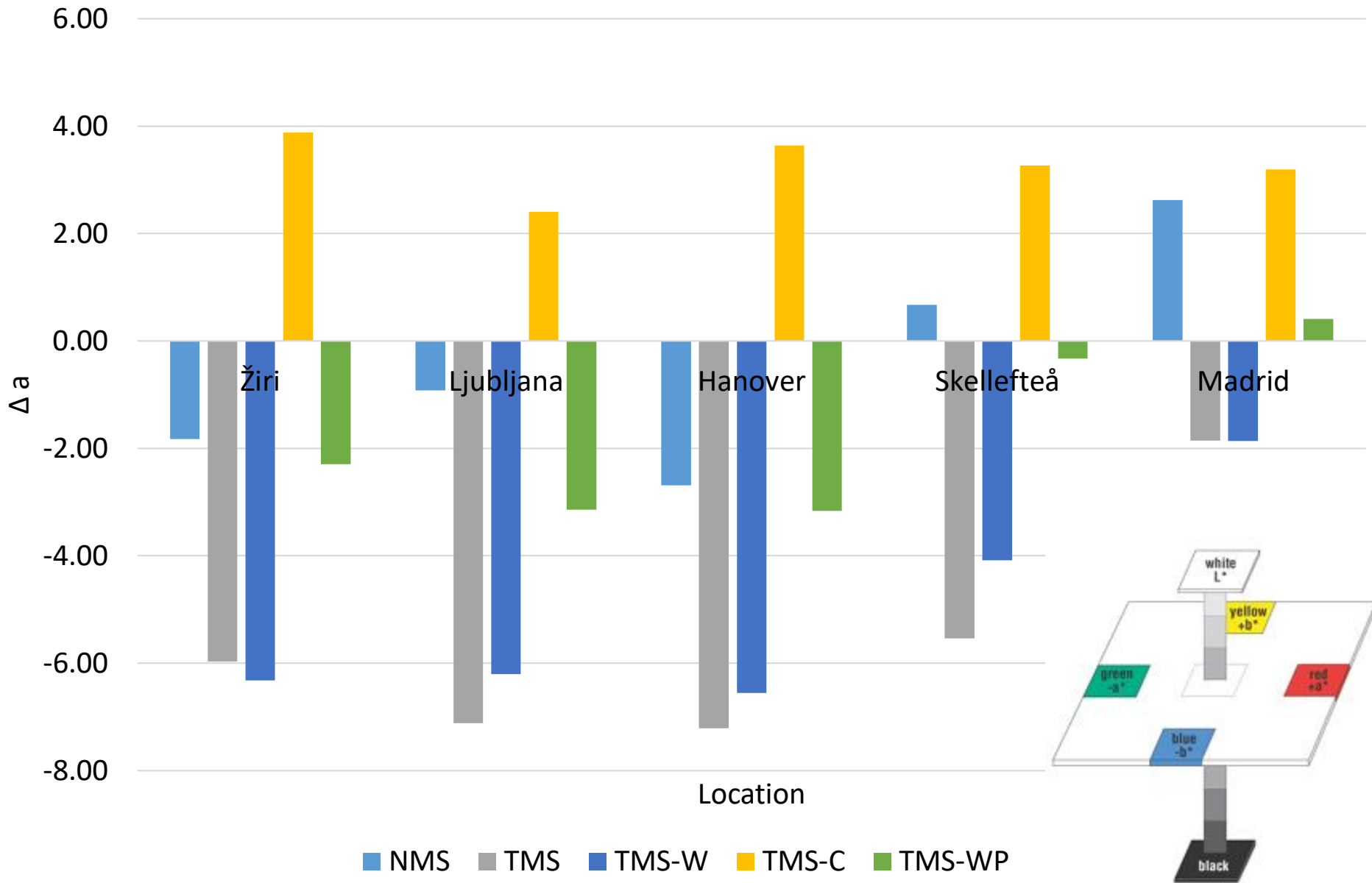
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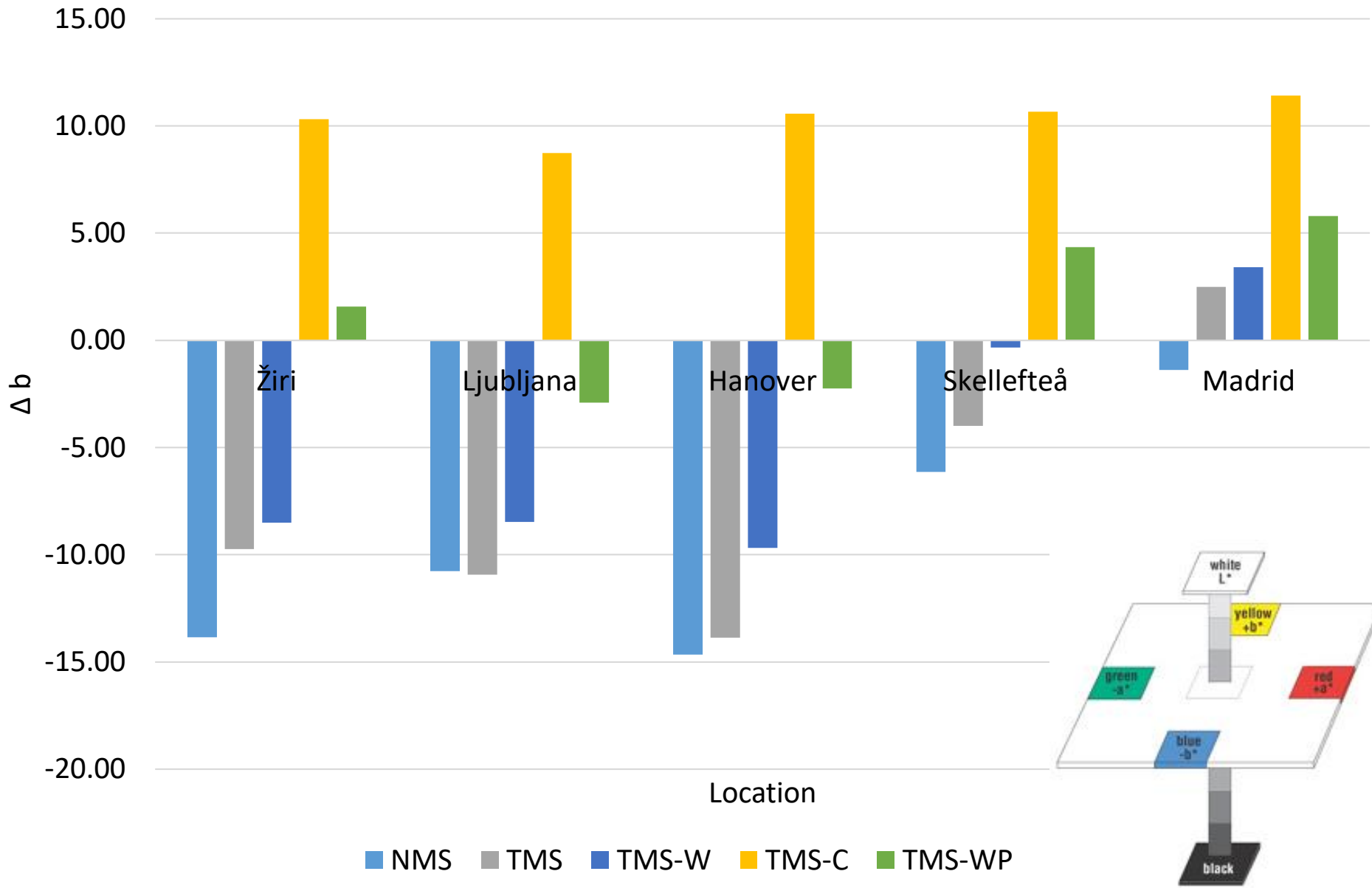
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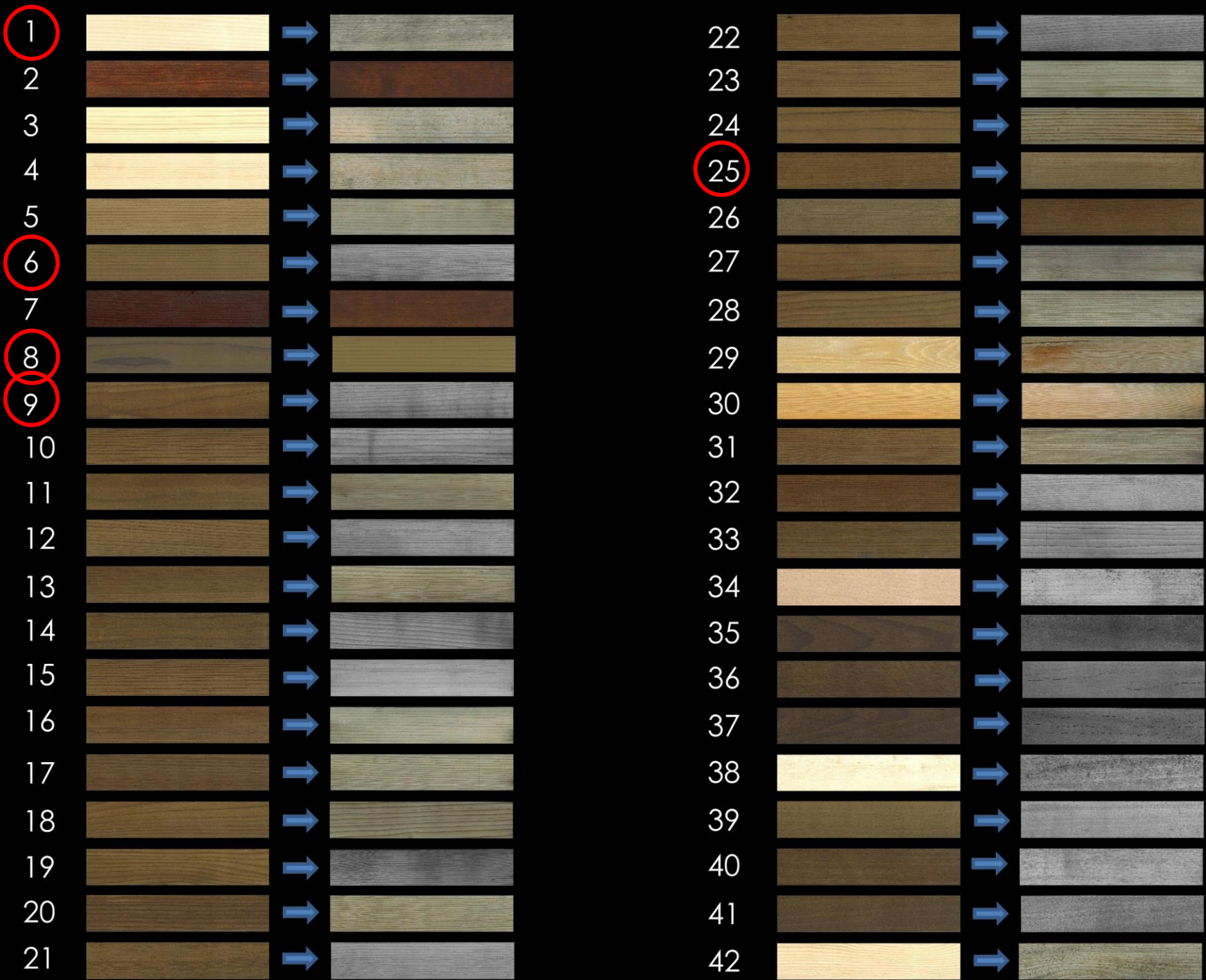
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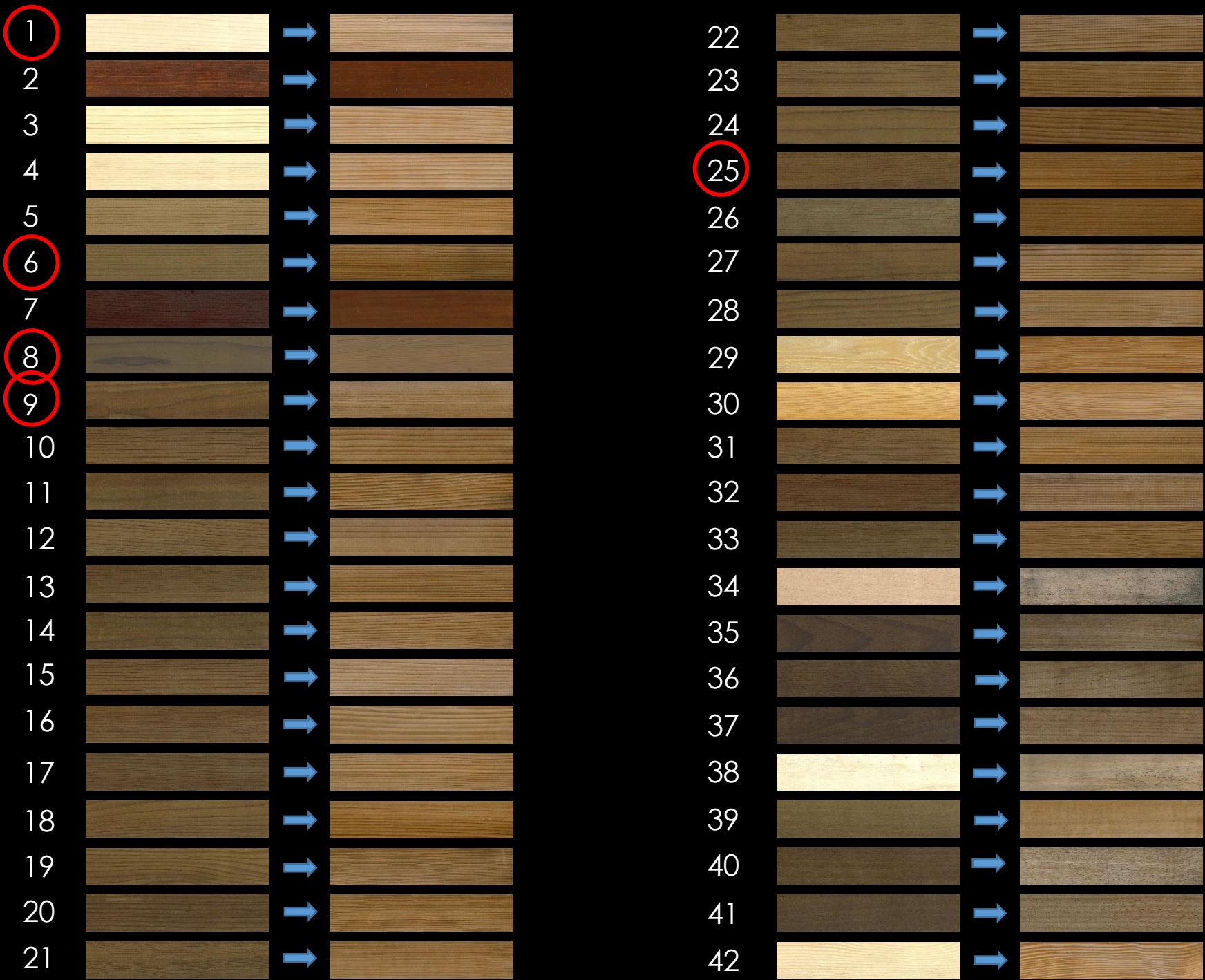


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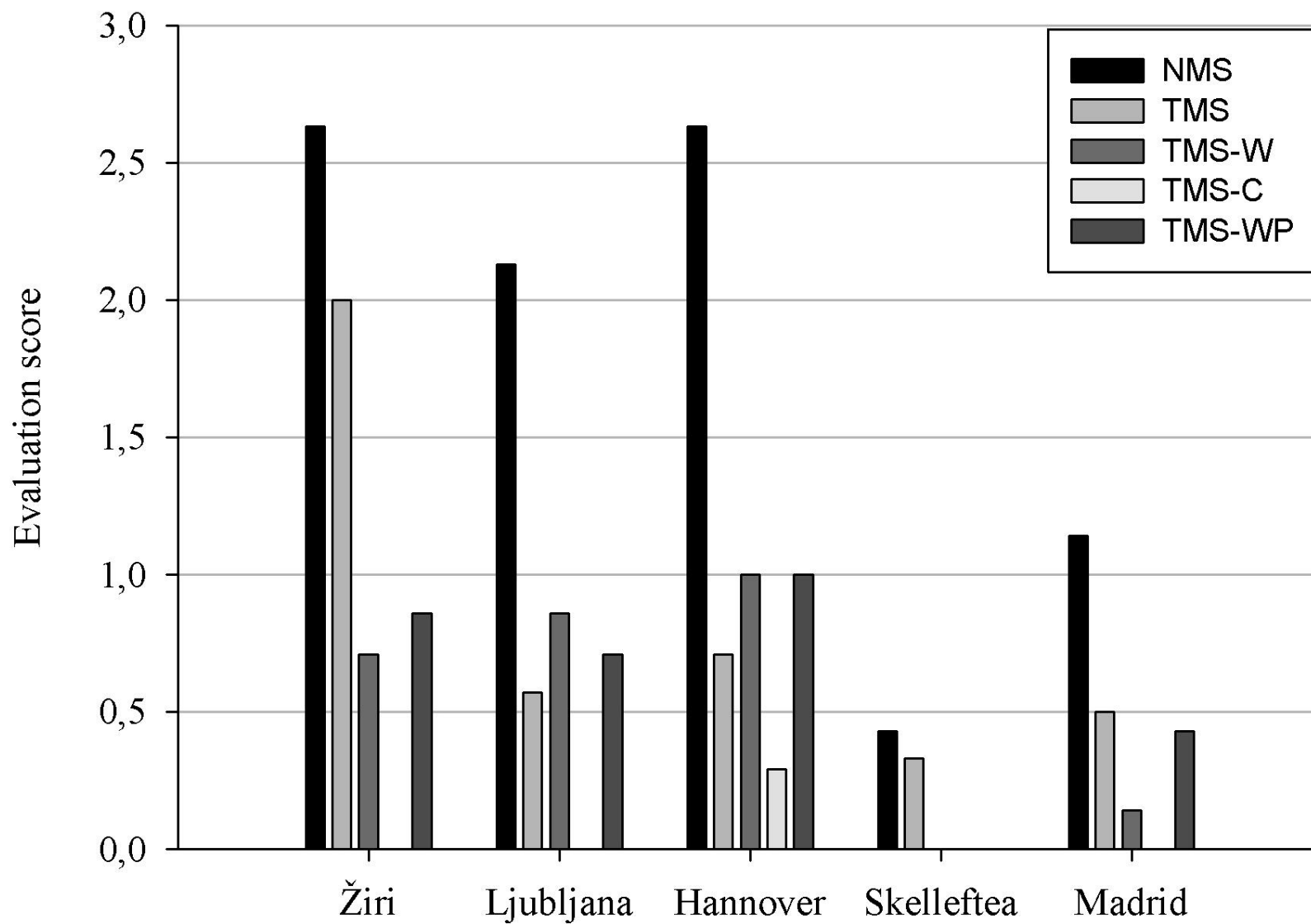






Madrid

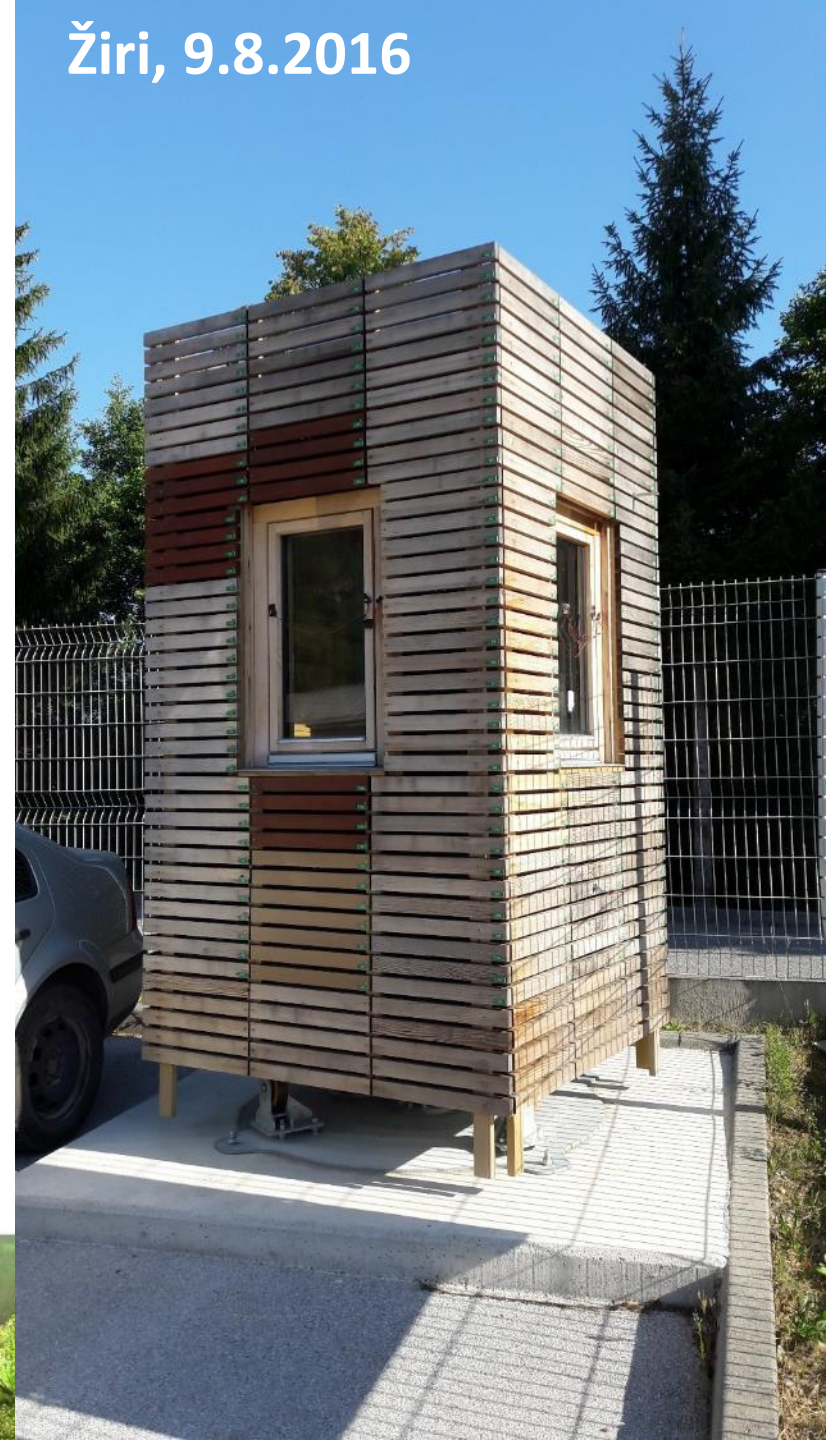
Moulds and stains, facade elements, period of 12 months



Žiri, 20.10.2015



Žiri, 9.8.2016



Skellefteå, 11.11.2015



18. 11. 2015

Skellefteå, 15.8.2016



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Skellefteå, August 2016



Ljubljana, July 2016



Žiri, August 2017



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Ljubljana, August 2017



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Žiri (Slovenia), 9. 9. 2016



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Žiri (Slovenia), 5. 9. 2017



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9. 9. 2016



5. 9. 2017



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Imejte svoj pogled

9. 9. 2016

5. 9. 2017



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Ljubljana, 13.8.2016



Ljubljana, 13.8.2017





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TAKE HOME MESSAGE

- MC is dependent on location – the lowest in Madrid, the highest in Ljubljana and Žiri.
- The highest MC of NMS, the lowest of TMS-W.
- Colour changes affected by precipitations the most.
- Mould intensity the highest in Žiri, Ljubljana and Hannover, the lowest in Madrid and Skellefteå.
- Wood MC and mould and stain growth fits relatively well to calculated Scheffer Climate Index and Dose values of all locations.
- TMS with wax and added pigment is the most promising product.

Q?

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