STOREPET; HEATLAND; STEELPROST – izzivi komercializacije naprednih in trajnostnih materialov

Vladimir Gumilar, Slovenski gradbeni grozd

SGGCCS

BRONZE Cluster Management Excellence
STRIVING FOR CLUSTER EXCELLENCE

Slovenski gradbeni grozd – Construction cluster of Slovenia

Supporting business development, innovation and transition to sustainable, digital and circular construc

Cluster since 2004, with members and networks involved in:

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EUROPEAN CLUSTER COLLABORATION PLATFORM

ECTP INNOVATIVE BUILT ENVIRONMENT

RENOVATE EUROPE

INTERNATIONAL CIRCULAR CONSTRUCTION CLUSTER

Construction Cluster of Slovenia

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SLOVENSKI GRADBENI GROZD
CONSTRUCTION CLUSTER OF SLOVENIA

ECCP Profile

Linkedin: slovenskigradbenigrozd

vladimir.gumilar@sgg.si

The construction industry is very important to the EU economy. It creates new jobs, drives economic growth, and provides solutions for social, climate and energy challenges. Those are the reasons why the sector must become more competitive, resource-efficient and sustainable.

Our cluster members are encouraged and supported to innovate, engage in development cooperation, digitalisation, transition to a circular economy and international cooperation.

With the International Circular Construction Cluster initiative, we want to spread awareness of the importance of the circular economy in the construction sector on an international level.

This year we celebrate 20 years of operation.

European Commission

EUROPEAN CLUSTER COLLABORATION PLATFORM

EUROPEAN CLUSTER CONFERENCE 2024

7-8 MAY 2024, BRUSSELS

EU projects 2024

Architecture Engineering Construction

LinkedIn

Key domains of work and related EU projects

INOVATIVNOST (GO INNOVATIVE)
raziskave, razvoj in prenos novih tehnologij, inovacije, svetovanje in usposabljanje, razvoj poslovnih modelov, odprte, sodelovalne inovacije

KROŽNOST (GO CIRCULAR)
trajnostna in krožna gradnja, krožno gospodarstvo in čez sektorsko sodelovanje, bio, zelena gradnja, znanja in sposobnosti

DIGITALIZACIJA (GO DIGITAL)
digitalizacija v gradbenem sektorju, Gradbeništvo 4.0. BIM, IOT, čez sektorsko sodelovanje

INTERNACIONALIZACIJA (GO INTERNATIONAL)
mednarodno razvojno in poslovno sodelovanje, mreženje, mednarodno sodelovanje med grozdi.

STOREPET; HEATLAND; STEELPROST

– izzivi komercializacije naprednih in trajnostnih materialov

- Exploitation and commercialisation challenges

STOREPET

SEVENTH FRAMEWORK PROGRAMME

SteelProst demo

SEVENTH FRAMEWORK PROGRAMME

life HEATLAND

Life

StorePET

Development of PCM-based innovative insulating solutions for the lightweight building sector

Theme FP7-SME-2011-2
GA 286730

Project end: November 2014

Consortium

SME-AGs

Coordinator

SLOVENSKI GRADBENI GROZD
CONSTRUCTION CLUSTER OF SLOVENIA

TECNIBERIA
ASOCIACIÓN ESPAÑOLA DE EMPRESAS DE INGENIERÍA, CONSULTORÍA Y SERVICIOS TECNOLÓGICOS

TEX CLUB TEC

buildingSmart

SMEs

Grupo ideo

GarcíaRama constructora mejor+fácil

PPT devan Chemicals

RTDs

Tecnologías Avanzadas Inspiralia S.L.
Part of the Peta Innovation Network

IPN

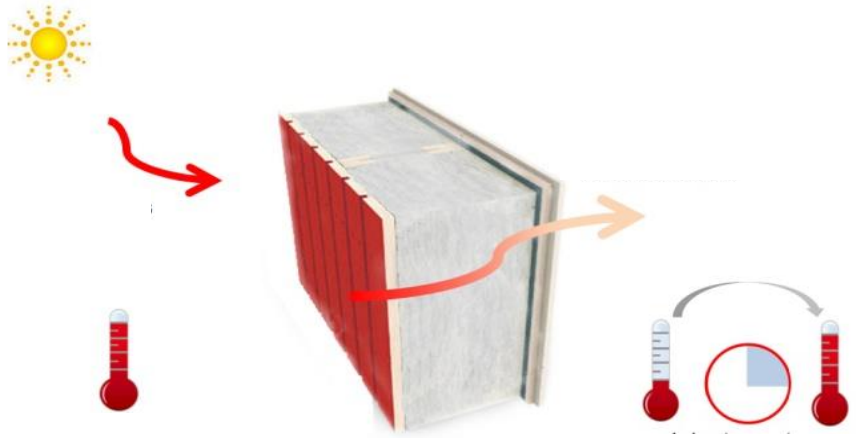
CENTRO TESSILE COTONIERO e ABBIGLIAMENTO SpA

acciona Infraestructuras


COVENT GAR

StorePET Action

Conventional Fiber Insulation

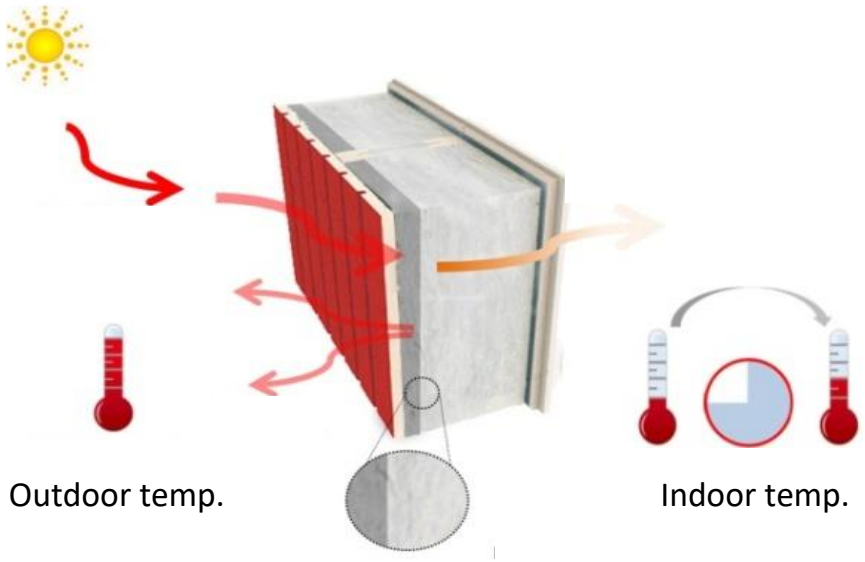


Outdoor temp. Indoor temp.

- The lack of thermal mass gives a very quick thermal response
- Although heavily insulated, it is impossible to maintain the indoor comfort temperature for long periods

StorePET

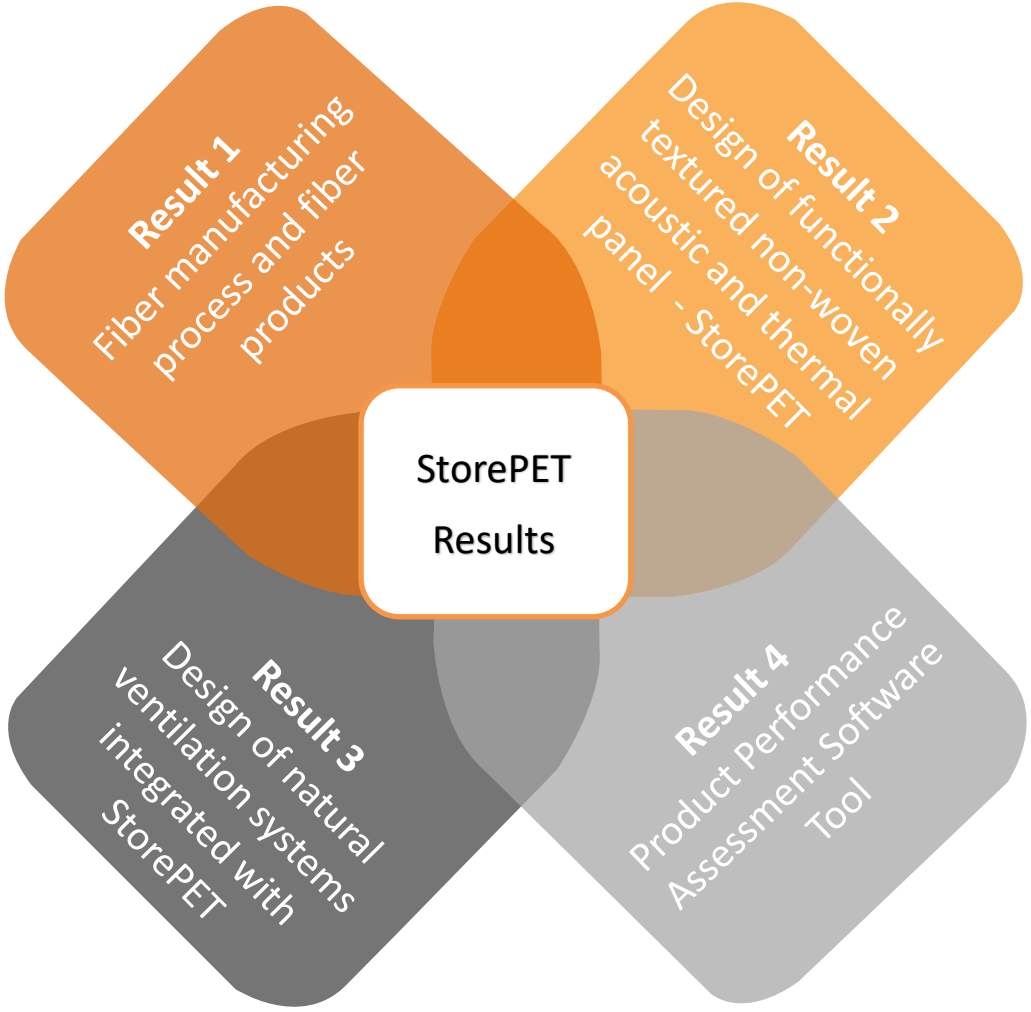
- Peak hour energy stored by the PCM and released back to the environment
- The PCM-fiber layer helps to reduce and delay the indoor peak temperatures, providing a slower thermal response of the system and extra thermal comfort for longer periods



Outdoor temp. Indoor temp.

Energy storage PCM-fiber layer **StorePET** Standard fiber insulation layer

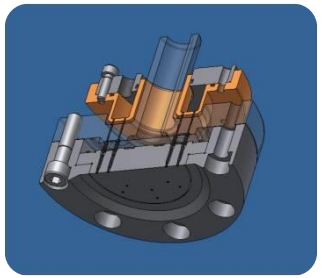
StorePET Results

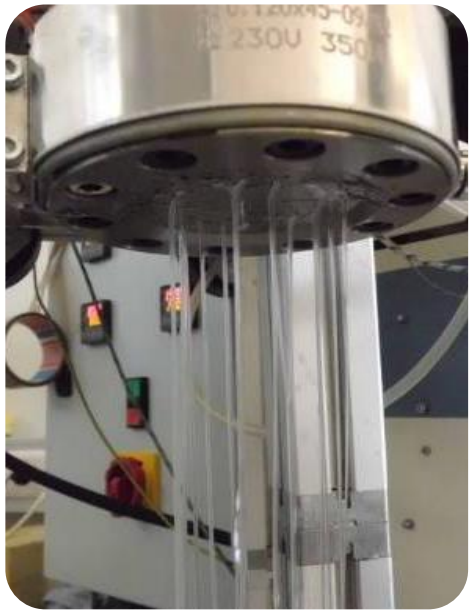


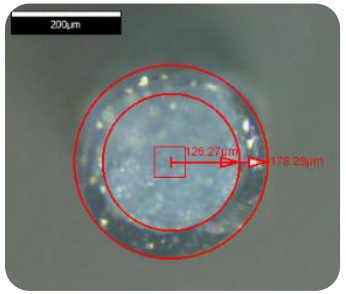
Main achievements

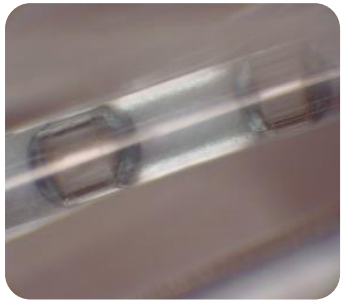
Result 1 - Fiber manufacturing process and fiber products

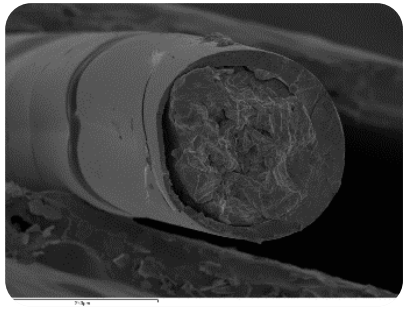
- Fibers modified/impregnated with raw/encapsulated PCMs on a single/multilayer bulk design
  1. Coaxial Melt Extrusion/Injection (bi-component PCM/polymer fibers)







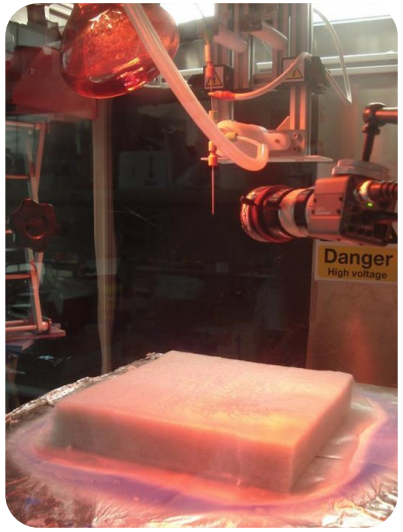


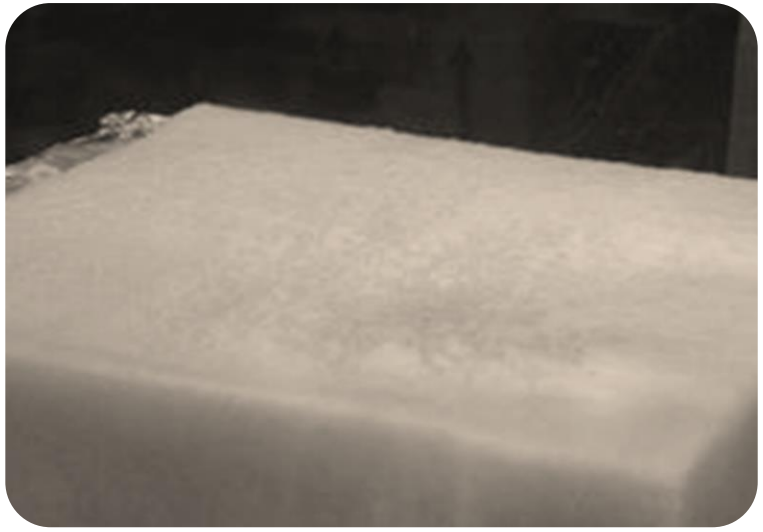


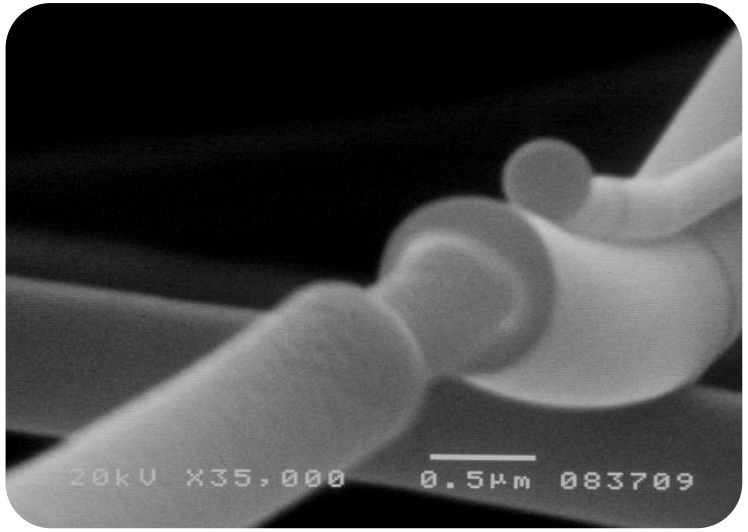
Main achievements

Result 1 - Fiber manufacturing process and fiber products

- Fibers modified/impregnated with raw/encapsulated PCMs on a single/multilayer bulk design
  2. Coaxial Electrospinning (micro/nano bi-component PCM/polymers fibers)



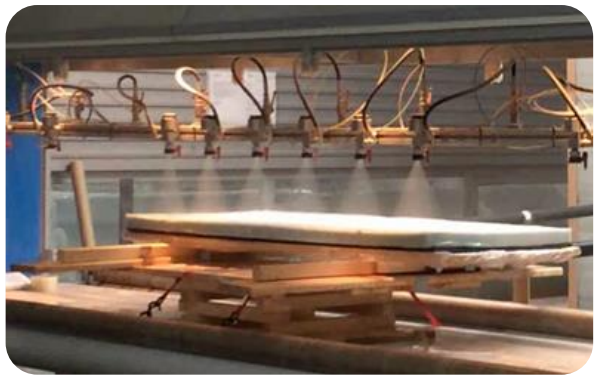


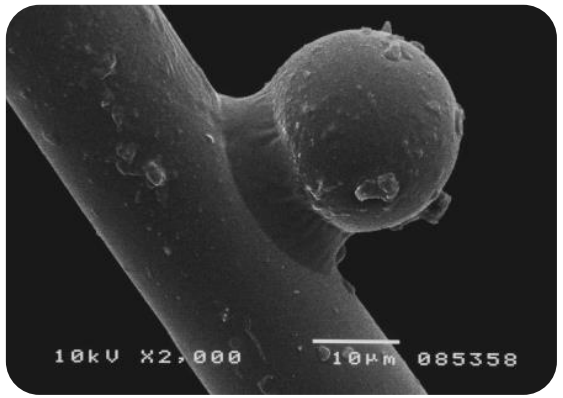


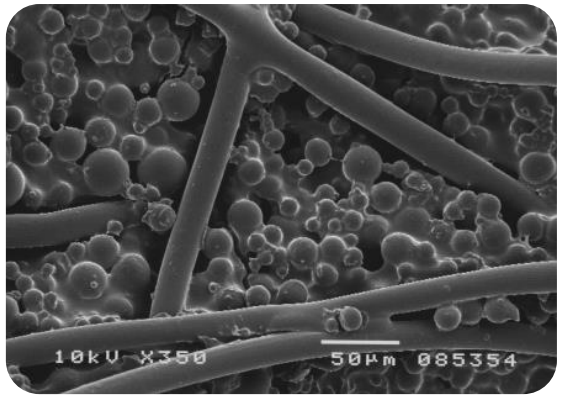
Main achievements

Result 1 - Fiber manufacturing process and fiber products

- Fibers modified/impregnated with raw/encapsulated PCMs on a single/multilayer bulk design
  3. Spraying deposition (micro-encapsulated PCM)







Main achievements

Result 2 - Design of functionally textured non-woven acoustic and thermal panel - StorePET

- StorePET - Novel PCM enhanced fiber insulation with heat storage capacities

Panel Form: 1,45 X 0,60 m (L x W) | Thickness: 84 mm
(other size and shapes possible)

Mass per unit area: 4.529 kg/m^2
Density: 53.85 kg/m^3

Heat flux reduction: 33%

Thermal conductivity: 0.0423 W/mK

Noise transmission insulation: 57-61dB

European fire classification: Class Bs1d0

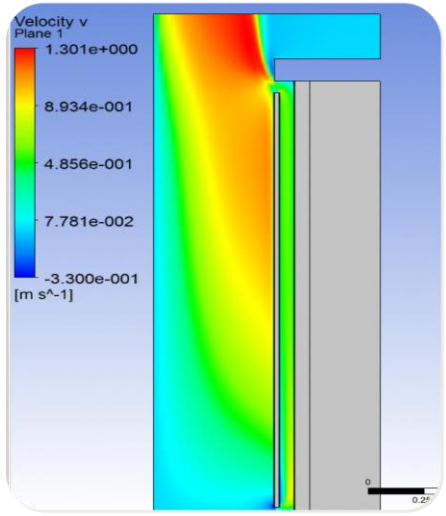
Production costs at pilot scale: 124€/m^2

Main achievements

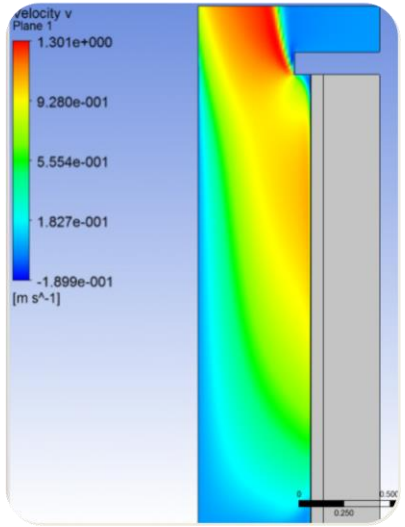
Result 3 - Design of natural ventilation systems integrated with StorePET

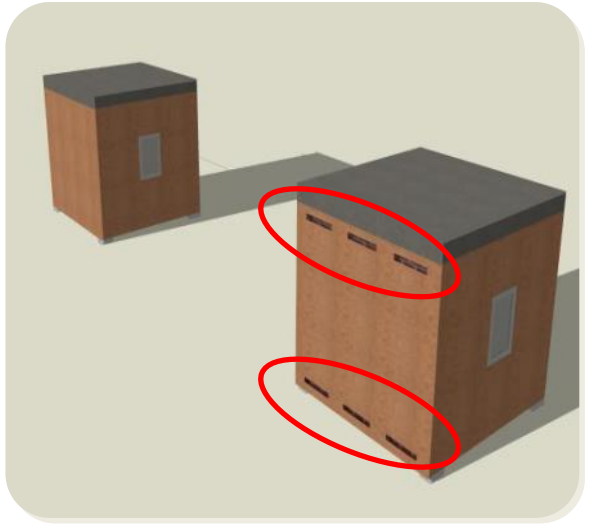
- StorePET integration in ventilated façades studied by simulation

Ventilated façade



Non-ventilated façade





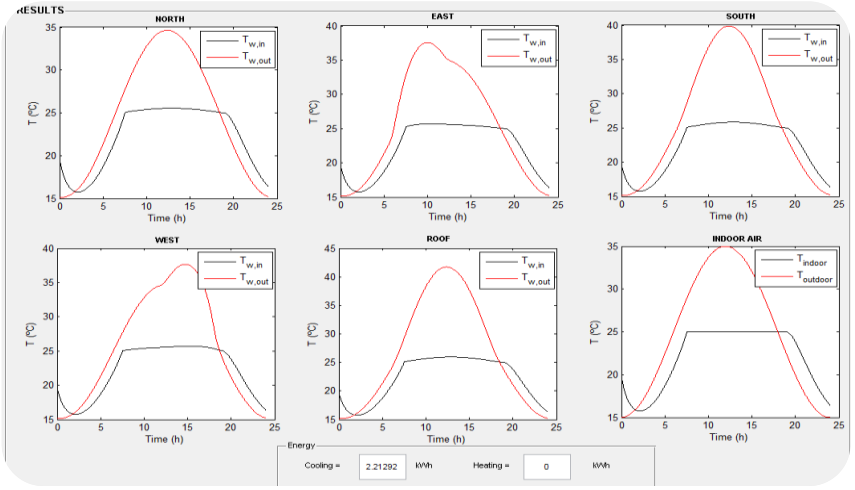
PCM	Ventilated façade	Cooling MJ/m^2	kWh/m^2	kWh	saving
NO	NO	14.9	4.1	34.8	base
ALL	NO	8.9	2.5	20.8	40.1%
ALL	West	7	1.9	15.6	55.2%
NO	West	11.8	3.3	27.7	20.4%
NO	ALL	6.5	1.8	15.2	56.3%
ALL	ALL	0.4	0.1	0.8	97.6%

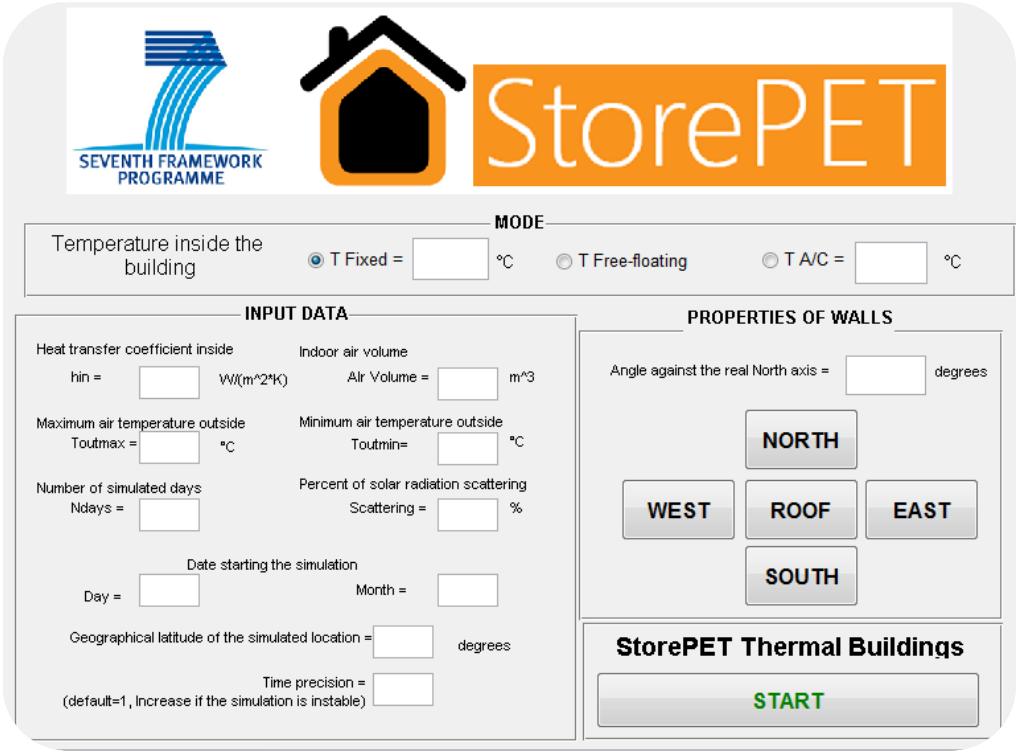
- Both ventilated façade and PCM have significant effect on energy consumption
- Using PCM and ventilated façade reduces cooling need nearly to zero (assuming 26°C indoor)

Main achievements

Result 4 - Product Performance Assessment Software Tool

- Software to assist production (product specification definition) and foreseen product performance according different constructive solutions and climates





StorePET technical compliance

- All the critical objectives of project linked with the technical compliance of the new developed StorePET product were either accomplished or very close to it.

Product Technical Objectives	Goal	Achieved	Remarks
Heat Flow reduction	~40%	33%	Very close to accomplish the objective
Noise transmission insulation	≥ 55 dB	57 dB 61 dB	Objective exceeded
Thermal conductivity	≤ 0.04 W/(mK)	0.04 W/(mK)	Objective accomplished
Thermal resistance for a nominal thickness of 100mm	≥ 2.5 m^2K/W	2.5 m^2K/W	Objective accomplished
European fire classification	Class Bs2d0 (at least)	Class Bs1d0	Objective accomplished

- Also, additional product characterization was accomplished (dimension, mass per unit of area, density, mechanical strength, water adsorption, moisture sorption, mildew and rot resistance and corrosiveness).

StorePET Follow-Up and Challanges

Possible routes for StorePET2

- Route 1 – StorePET 1 scale-up production
  StorePET 2 dedicated to the refinement of the encapsulated PCM-fiber mixture approach on a industrial scale – Demo-like project
- Route 2 – StorePET scale-up production focus on PCM-fiber encapsulation
  StorePET 2 dedicated to the development of non-encapsulated PCM core-sheath fibers systems by extrusion/injection with a high industrial up-scale focus – Demo-like project
- Route 3 – StorePET demonstration
  StorePET 2 dedicated to the demonstration of StorePET1 **installation potentials of on a larger scale** and the assessment of its integration on the retrofitting of residential buildings – Demo-like project
- Route 4 - Develop alternative products with PCMs for building applications
  Different bulk matrices other than nonwoven materials, dedicated insulation systems (walls and roofs thermal insulation and HVAC), ready-made "sandwich" particles/sections, supporting fixtures like windows, doors, cabinets, etc., industrial applications, etc.
- Route 5 - Develop alternative products with PCMs for non-building applications

- Research goals compliance, vs market requirement compliance and viability
- Production costs
- Fire resistance

- **In STOREPET 2 – different set of partners should be leading the project, focusing on road to market**

STEELPROST

SteelProst
demo

Innovative Fire Protective
Coatings for Steel Structures

Inovativni premaz za požarno zaščito jeklenih konstrukcij

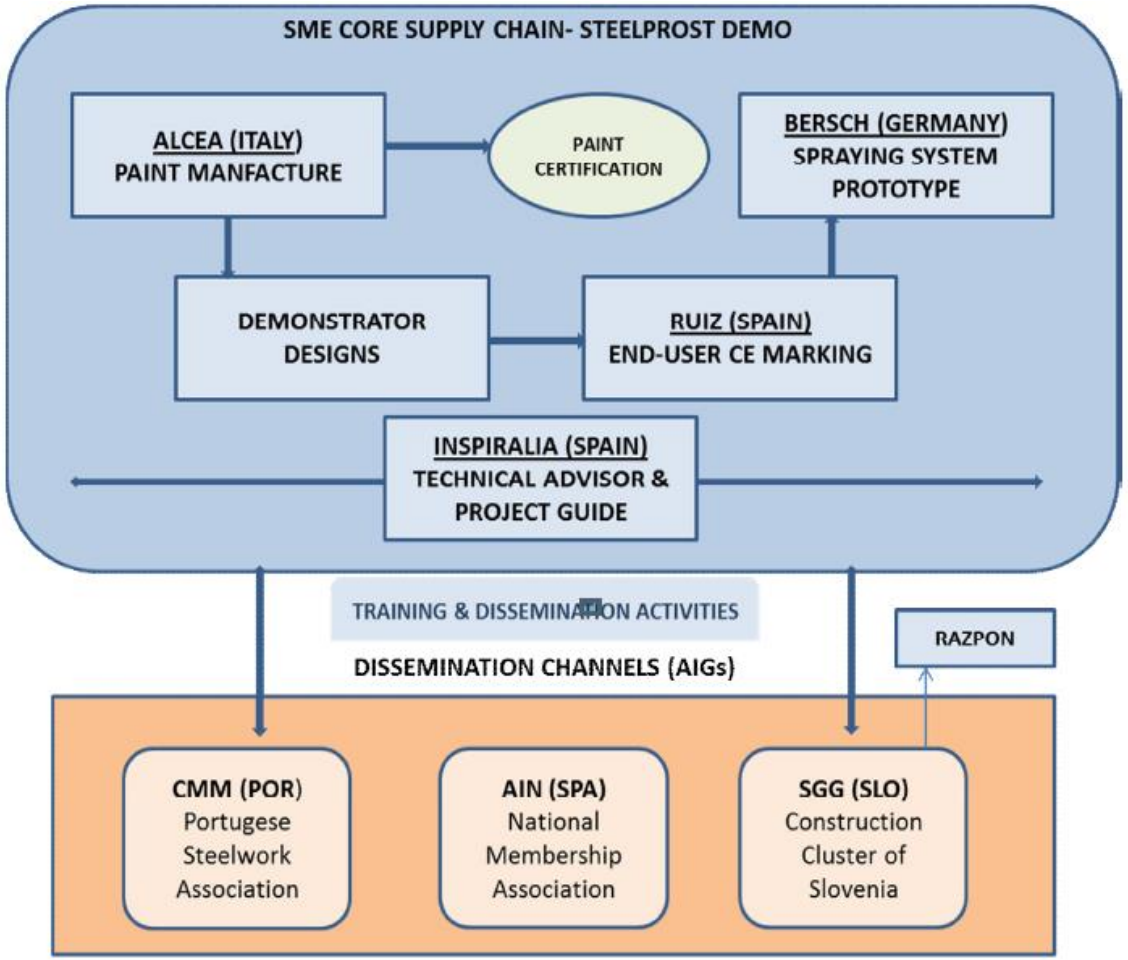
SEVENTH FRAMEWORK
PROGRAMME

Povzetek projekta:

- Namen projekta SteelProject je bil razvoj **učinkovitega sistema za požarno zaščito jeklenih konstrukcij,** na osnovi intumescenčnih premazov. Razvit integriran sistem vključuje:

  - Nov, izboljšan intumescenčni premaz (sistem).
  - Avtomatski sistem za nanos in sušenj premazov za gradbišča (on-site) in izvedbe v obratu (off-site).
  - Integracija rezultatov projekta v certificiranje in CE označevanje proizvodnje pri proizvajalcih jeklenih in aluminijastih nosilnih konstrukcij (SIST EN 1090-1:2009, Izvedba jeklenih in aluminijastih konstrukcij - 1. del: Zahteve za ugotavljanje skladnosti sestavnih delov konstrukcij).
  - Študije izračunov požarne odpornosti za različne scenarije požara.
  - Certificiranj premaza SteelProst v skladu z EN-13381-8, široka razpoložljivost podatkov za požarno odpornost za različne požarne obtežbe.
  - Izdelava gradiva za pomoč in usposabljanje izračuna požarne odpornosti kostrukcij in požarne zaščite.

Projektni konzorcij

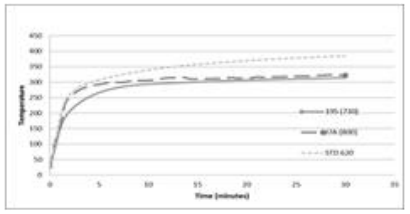


FP7 Projekt SteelProst

- SteelProst / GA: 243574.
  - **Akronim**: STEELPROST
  - **Proračun projekta:** 2.368.529,32 €
  - **Razpis:** FP7-SME-2010-2
  - **Trajanje**: 30 mesecev
  - **Začetek**: 2010-05-01
  - **Konec**: 2012-10-31
  - **Subvencija:** 1.871.649,00 €.
  - **TRL3 ➔ TRL6**

- SteelProst DEMO / GA: 604920.
  - **Akronim**: STEELPROST DEMO
  - **Proračun projekta** : 1.068.452,20 €
  - **Razpis** : FP7-SME-2013-3
  - **Trajanje**: 26 mesecev
  - **Začetek**: 2013-09-01
  - **Konec**: 2015-11-30
  - **Subvencija**: 605.350,60 €
  - **TRL6 ➔ TRL9**

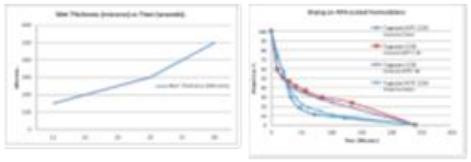
Naloge industrijskih partnerjev v demo projektu. TRL6 ➔ TRL9



Formulation-Process

Commercial Certified Paint

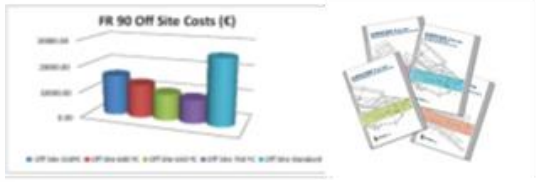
ALCEA



Drying Optimization

Commercial Drying Spraying Booths

ain DÜRR



Results Integration

CE Marking for Project and Constructions

RAZPON d.o.o.

TALLERES RUIZ S.A.

Research

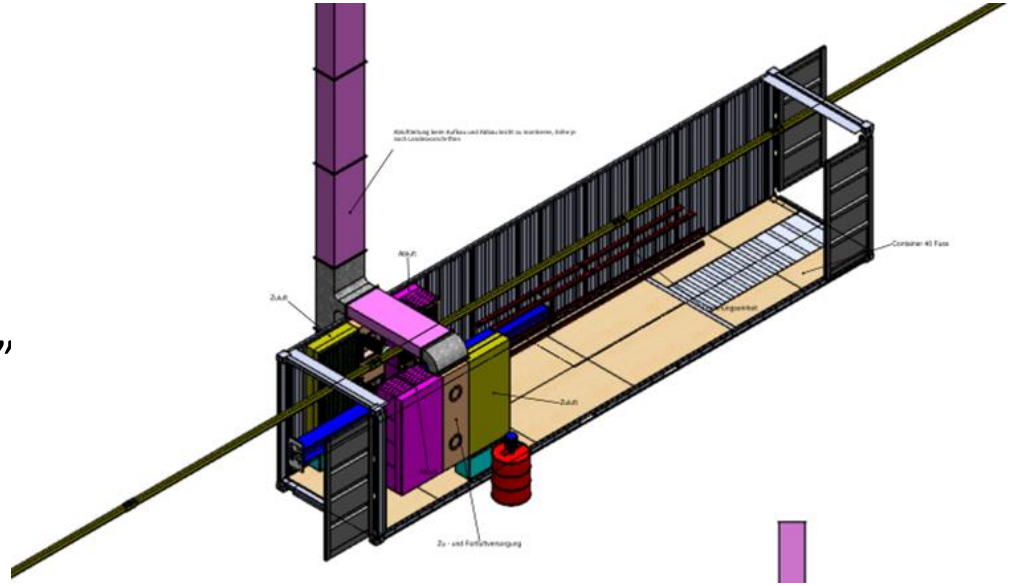
DEMO

Lastnosti SteelProst intumescenčnega premaza

- Izboljšana učinkovitost z nano komponentami
- Uporabnost za različna temperaturna območja.
- Razpoložljivost spremenljivke Lambda (toplotna prevodnost zaščitnega sloja) za izračun požarne odpornosti za lokalizirane in naravne požarne scenarije.
- Nizka ekspanzijska temperatura. Zmanjšani izpusti strupenih emisij.
- Patentirana tehnologija.
- Požarna odpornost (FR) do 120 minut in dalj.
- Premaz bo na trgu dosegljiv v 2015.

SteelProst sistem za nanos in sušenje

- Sistem za avtomatski način nanosa premaza z razprševanjem
- IR ali zračni sistem sušenja.
- Nanos in sušenje. (izvedba za 6 m profile)
  - 1000 µ = (32-24 min).
  - 750 µ = (24-18 min).
  - 500 µ = (16-12 min)
  - 250 µ = (8-6 min)
- Rešitve za izvedbo na gradbišču “On site” ali v obratu “Off site”
- Možnosti za prilagoditve sistema.



SteelProst učinki za končne uporabnike:

- Manjša poraba materiala
- Manjši stroški izvedbe reduction.
- Certificiran sistem in demonstrirana požarna odpornost.

- Nova znanja glede načrtovanja konstrukcij in požarne odpornosti konstrukcij

Izkoriščanje znanja (patent)

- STEELPROST GA243574 / Consortium Agreement

Result No	Project Result	ECSS	AIN	SGG	ALCEA	BERSH	RUIZ	RAZ
1	Completed specification criteria with respect to chemical, physical, operational and regulatory aspects for the development of Steelprost technology.	OWNERSHIP	OWNERSHIP	OWNERSHIP	LICENSING	LICENSING	-	-
2	Fire retardant chemical additives	OWNERSHIP	OWNERSHIP	OWNERSHIP	LICENSING	LICENSING	LICENSING	LICENSING
3	Mechanically resistant fire retardant coating formulation.	OWNERSHIP	OWNERSHIP	OWNERSHIP	LICENSING	LICENSING	LICENSING	LICENSING
4	Rapid drying processes and mechanisms	OWNERSHIP	OWNERSHIP	OWNERSHIP	LICENSING	LICENSING	LICENSING	LICENSING
5	Development of an integrated Steelprost system, including results from functional testing and industrial validation incl. economical analyses	OWNERSHIP	OWNERSHIP	OWNERSHIP	LICENSING	LICENSING	LICENSING	LICENSING

SteelProst – izzivi komercializacije

- Tehnološke težave pri prenosu v polproizvodnjo
- Industrijski partner ALCEA – proizvod ni ključni del portfolia
- Testiranje in certificiranje EN 13381-8 – tehnološki in finančni izziv z velikim rizikom glede rezultatov
- Uporaba koeficienta λ – zahteven proces načrtovanja konstrukcij in požarne odpornosti konstrukcij
- Tehnološka komercializacija (licenciranje) ni neposredno izvedljivo – **potrebne dodatne raziskave na nivoju proizvodnje in preiskusi na realnih objektih**

- **Še vedno poteka izkanje poslovnega partnerja za odkup patenta**

PROJEKT LIFE HEATLAND

(LIFE16 CCA/ES/000077)

HEATLAND

HLADNE PROMETNE POVRŠINE ZA ZMANJŠEVANJE UČINKOV MESTNIH TOPLOTNIH OTOKOV

COOL PAVEMENTS TO MITIGATE THE URBAN HEAT ISLAND EFFECT

ctcon Centro Tecnológico de la Construcción

chm

Murcia

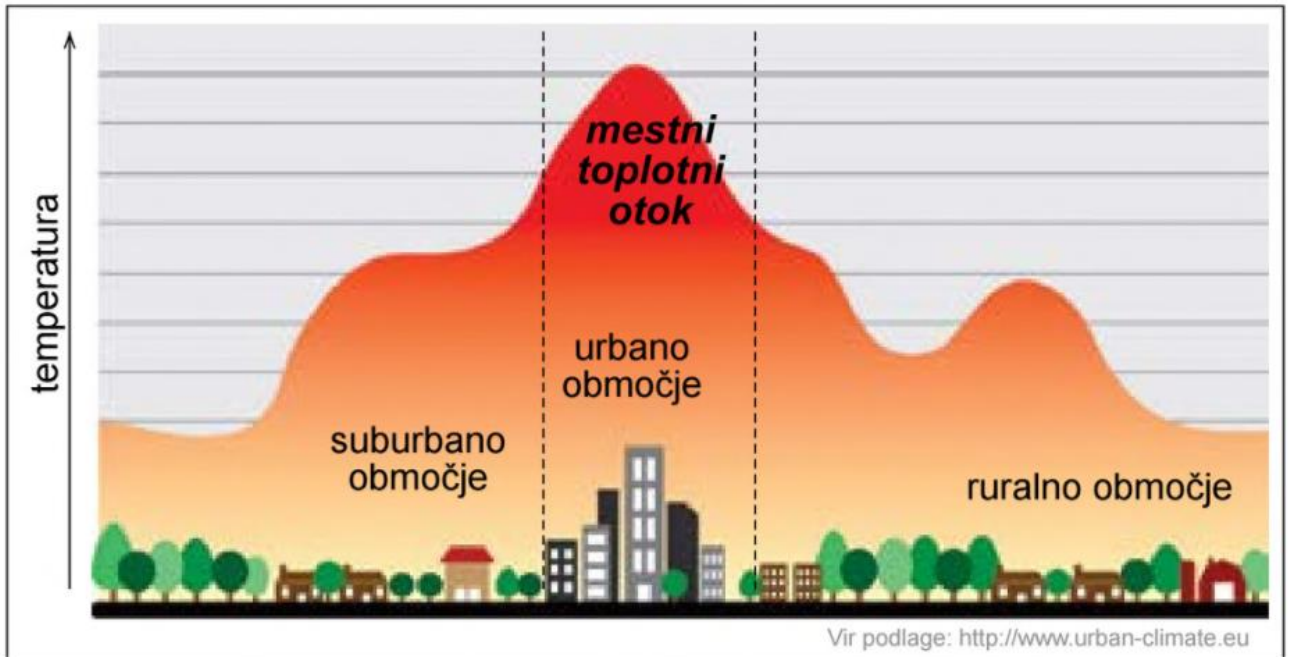
frecom

SGGCCS SLOVENSKI GRADBENI GROZD CONSTRUCTION CLUSTER OF SLOVENIA

Life

1. MESTNI TOPLOTNI OTOKI

- Urbanizacija - zmanjševanje zelenih površin in zemlje – mestni toplotni otoki /Urban Heat Island / UHI
- Povprečna letna temperatura v mestih je lahko za 1-3 °C, v večjih pa celo do 12 °C
- Učinek podnebnih sprememb bo še poslabšal



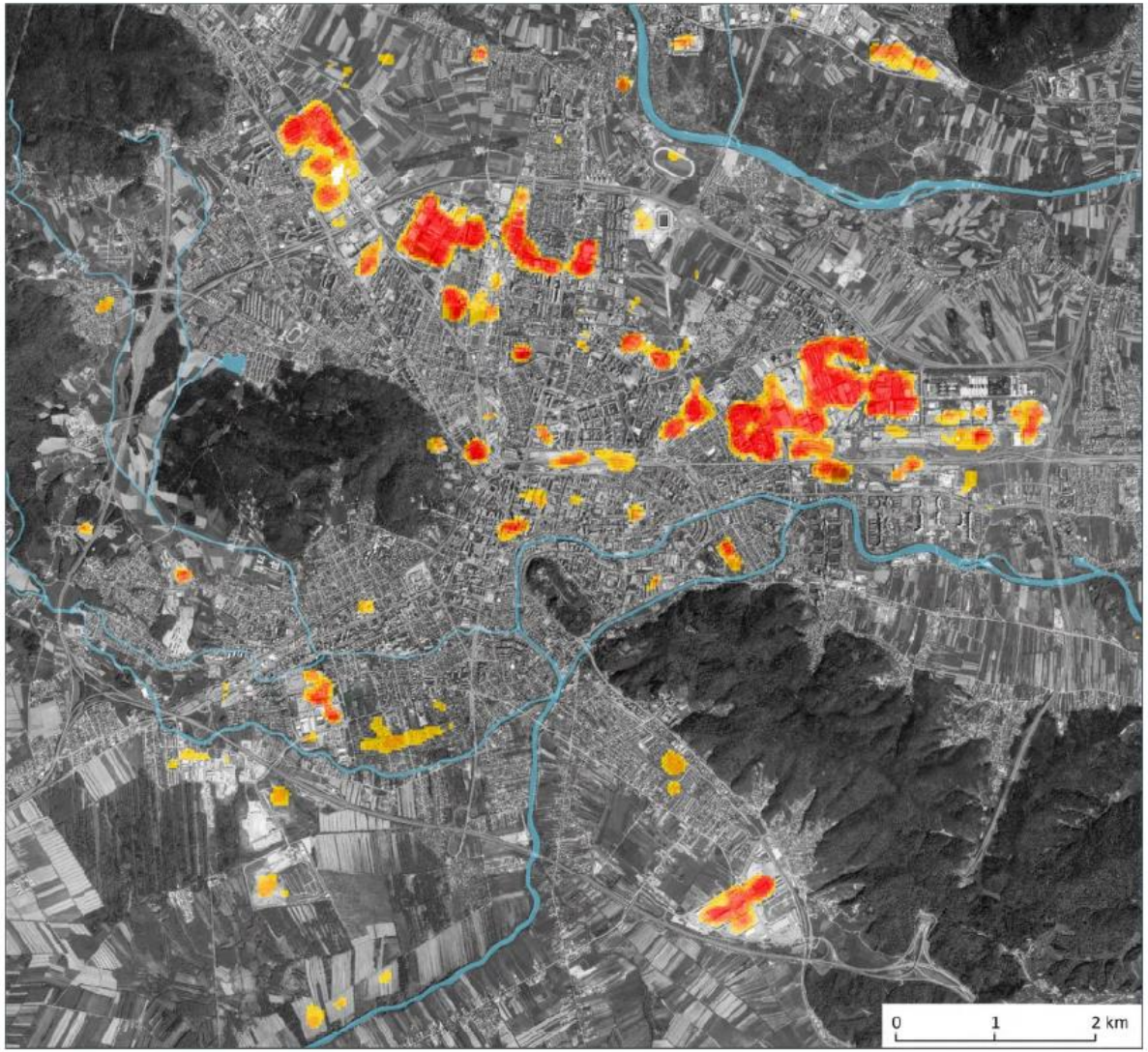
Primer: Ljubljana

Satelitsko termično snemanje Ljubljane

- končno poročilo -

Prejemnik:	Mestna občina Ljubljana Mestna uprava Oddelek za varstvo okolja Zarnikova 3, 1000 Ljubljana
Izdelal:	ZRC SAZU Novi trg 2, 1000 Ljubljana
Davčna številka:	SI38048183
Matična številka:	5105498
Vodja projekta:	dr. Krištof Oštir
Telefonska številka:	01 47 06 496
Poročilo pripravili:	dr. Krištof Oštir dr. Žiga Kokalj Rok Cedilnik

V Ljubljani, 21. marca 2014



Slika 11: Frekvenca pojavljanja zgornjih dveh odstotkov najvišjih temperatur na pozidanih območjih brez decembrskega in januarskega posnetka. Slednjih nismo vključili v analizo zaradi preveč poudarjenega vpliva južnih pobočij.

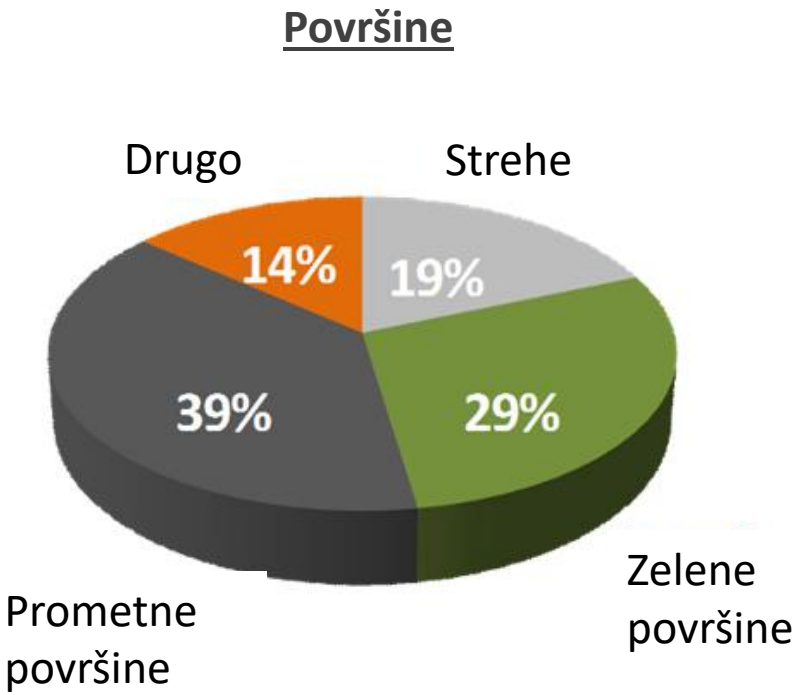
1. MESTNI TOPLOTNI OTOKI

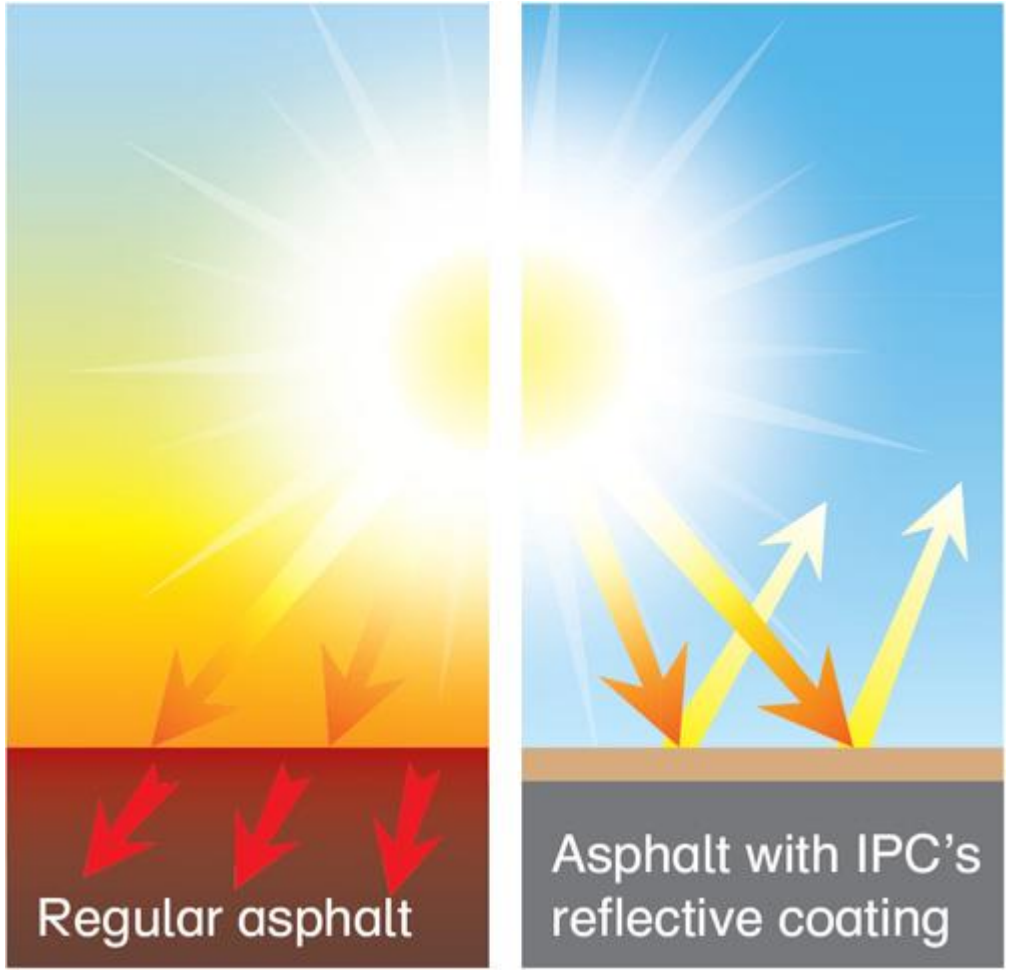
Rešitve

- ✓ Senčenje
- ✓ Zelene strehe
- ✓ Hladne strehe
- ✓ **Hladne površine**

Fuente: Reducing Urban Heat Islands: Compendium of Strategies. U.S. Environmental Protection Agency (2008).

1. HLADNE PROMETNE POVRŠINE



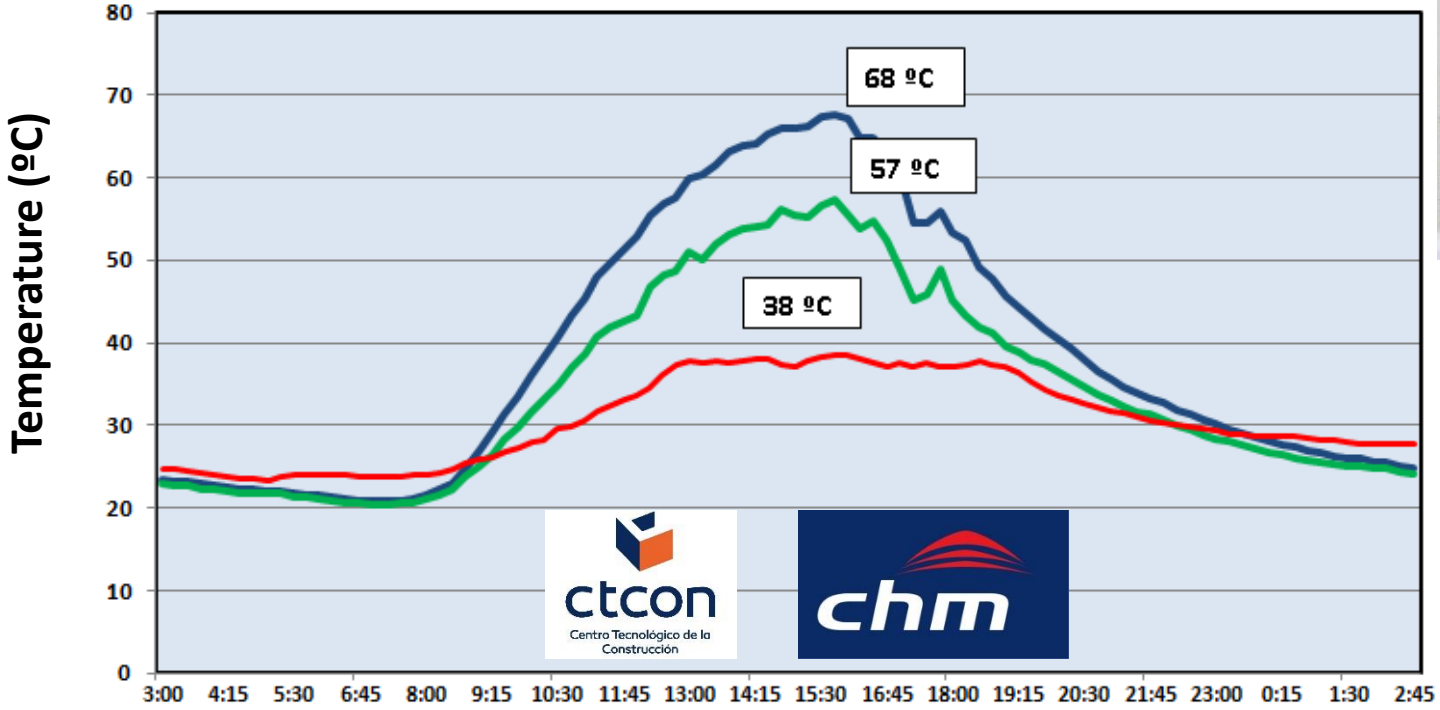


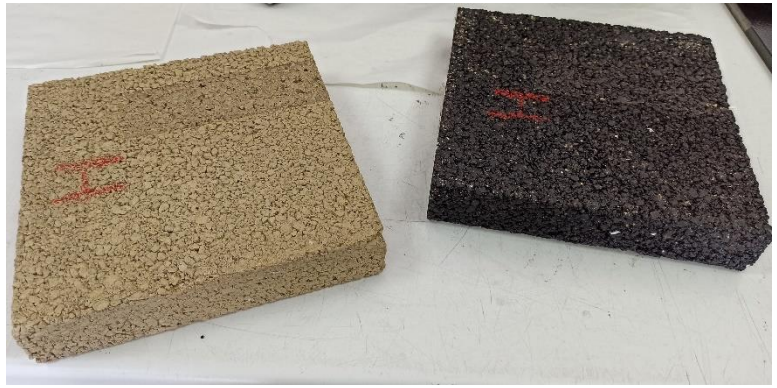
1. HLADNI ASFALT – predhodne raziskave

Površinska temp = Prostorska Temperatura

PROYECTO REPARA 2.0
Desarrollo de nuevas técnicas y sistemas de información para la REhabilitación sostenible de PAvimentos y carreteRAs

Merjenje površinskih temperature 2016-07-30





Tradicionalni asfalt

Hladni asfalt

Temperatura zraka

1. Hladni asfalt

- ✓ Agregat – apnenec
- ✓ prozorno sintetično vezivo
- ✓ pigmenti titanovega in železovega oksida

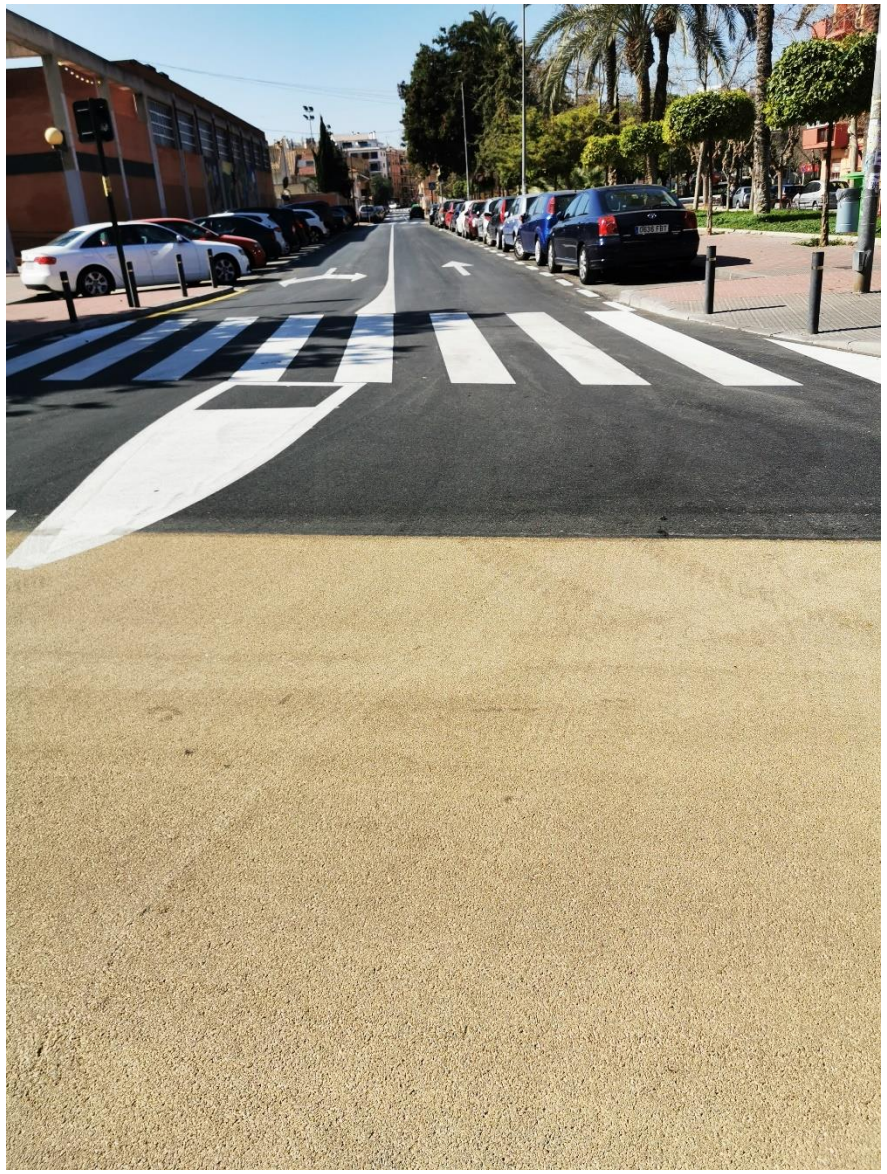
2. CILJI PROJEKTA

- Zmanjšanje učinkom mestnih toplotnih otokov (Urban Heat Island (UHI), z zmanjševanje površinske in prostorske temperature
- Prispevati k boljši kakovosti življenja prebivalcev
- Doseči energijske prihranke v urbanem okolju
- Zmanjšati onesnaževanje zraka
- Razviti orodje za oceno učinkov izvedbe hladnih prometnih površin (tlakov, asfaltov) v kateremkoli mestu.

3. IZVEDBA PROJEKTA

4. REZULTATI: VIZUALNI UČINEK

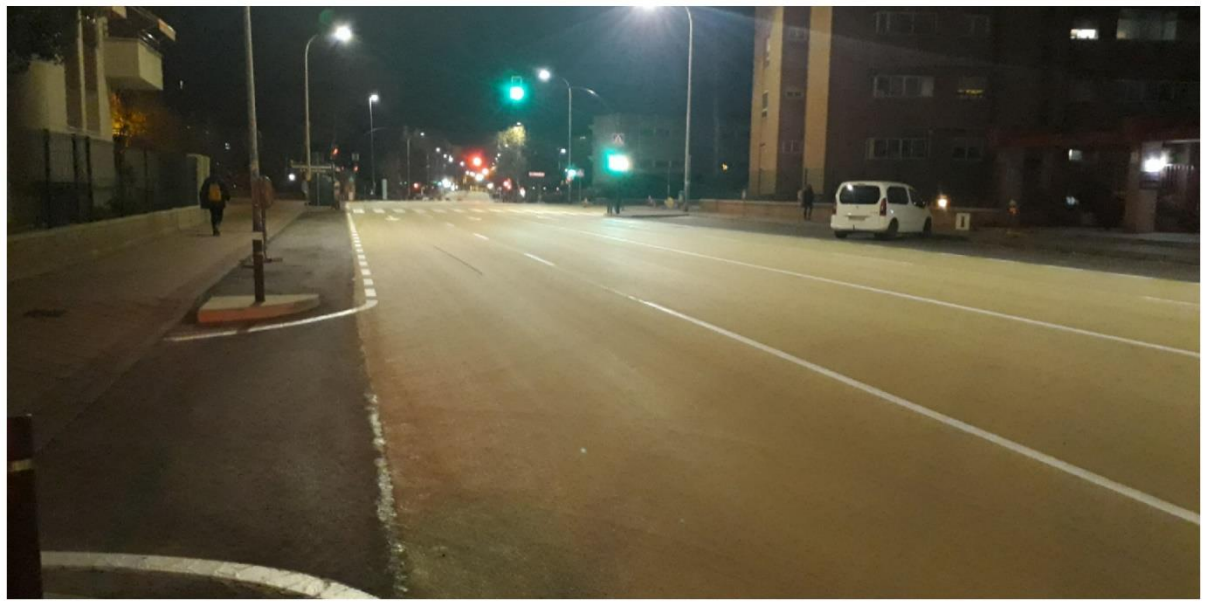
SLIKE izvedenih del – februar 2020



4. REZULTATI: VIZUALNI UČINEK

SVETLOST

150 % povečanje ob koncu izvedbe

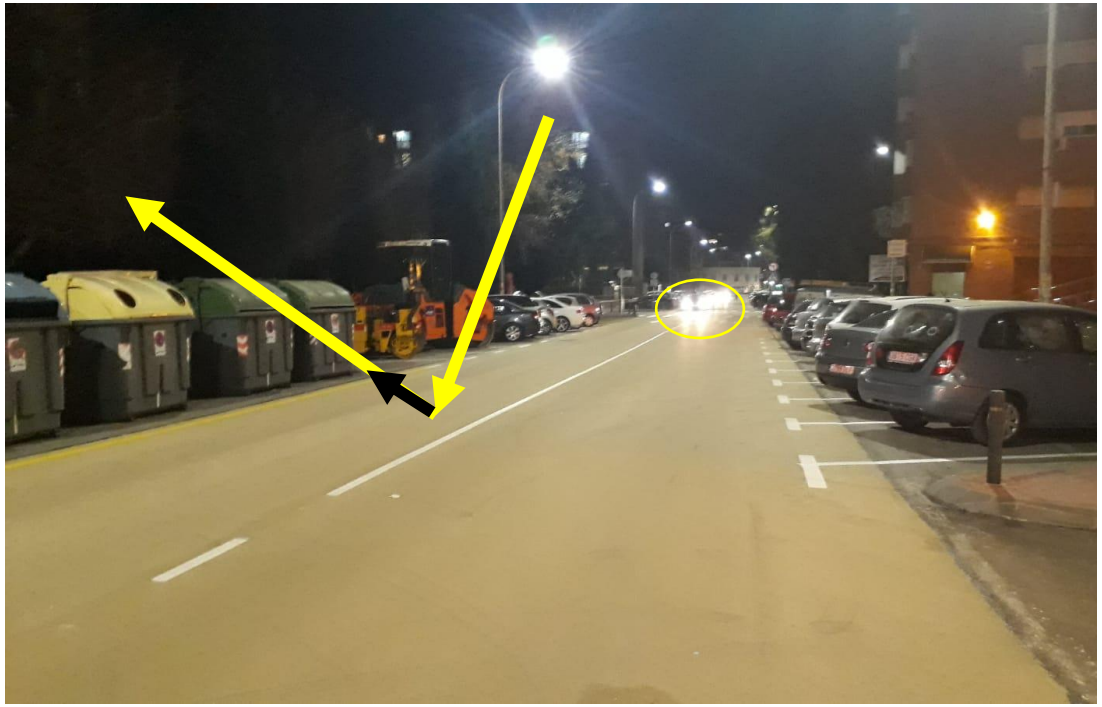


4. REZULTATI: VIZUALNI UČINEK

SVETLOST

100 % po enem letu

0 DAYS AFTER IMPLEMENTATION



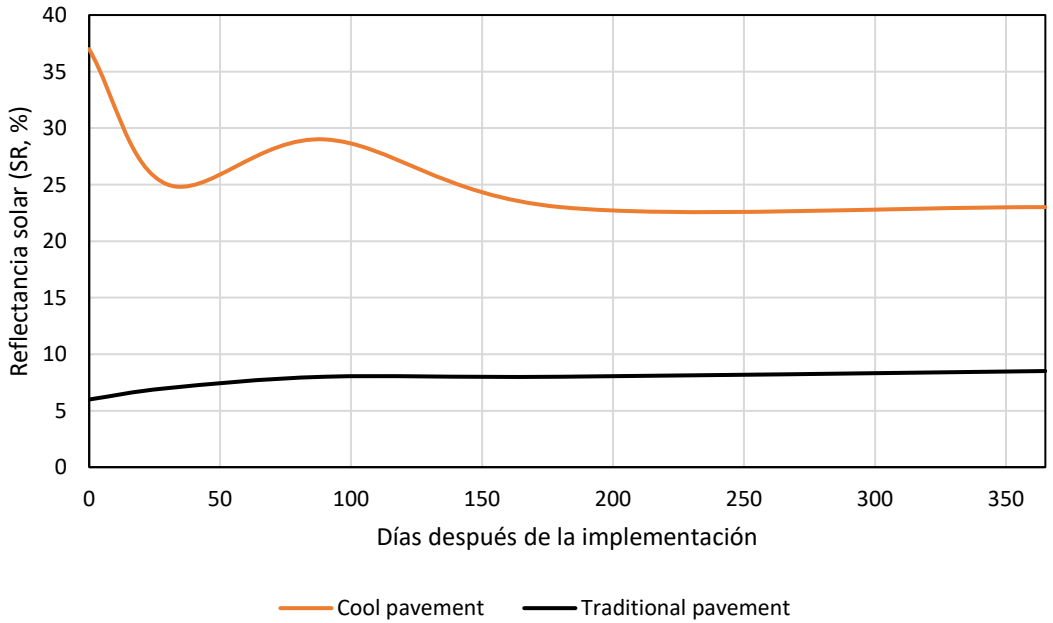
365 DAYS AFTER IMPLEMENTATION

4. REZULTATI: SONČNA ODBOJNOST

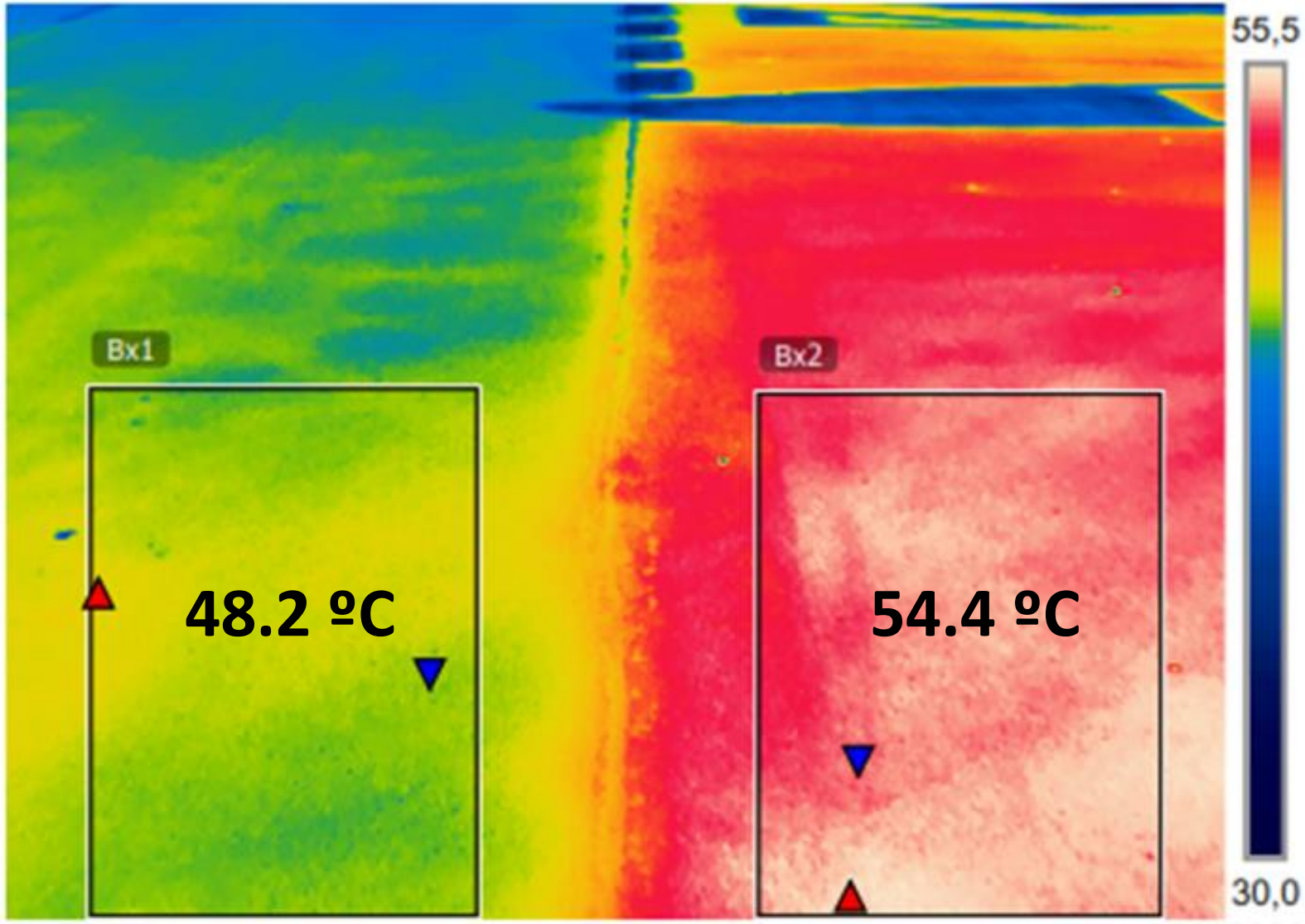
POVRŠINA	DNEVI PO IZVEDBI				
	0	30	90	180	365
HLADNA	37	25	29	23	22-24
TRADICIONALNA	6	7	8	8	8-9

-4%

+170%



4. REZULATITI: TOPLOTNI UČINKI



6. MAJ 2020
6.2 °C razlike pri najbolj neugodnih pogojih

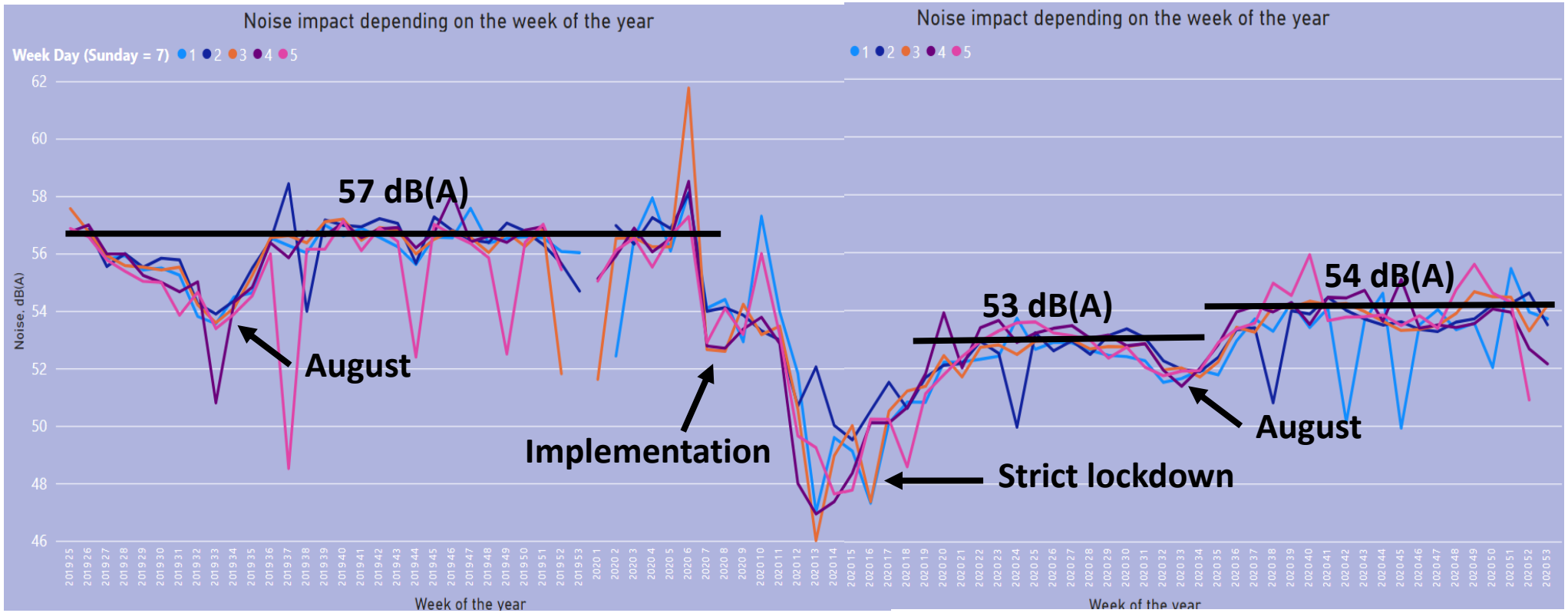
4. REZULTATI: TOPLOTNI UČINKI

Umaz-Čisti temp. razlika = 4.7 °C

Trad-Čisti temp. razlika = 13.1 °C

4. REZULTATI: UČINKI GLEDE HRUPA

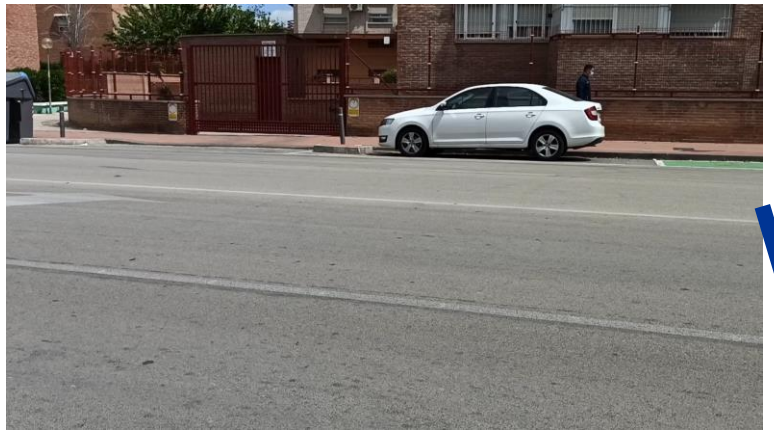
Hrup zmanjšan za 3 dB(A)



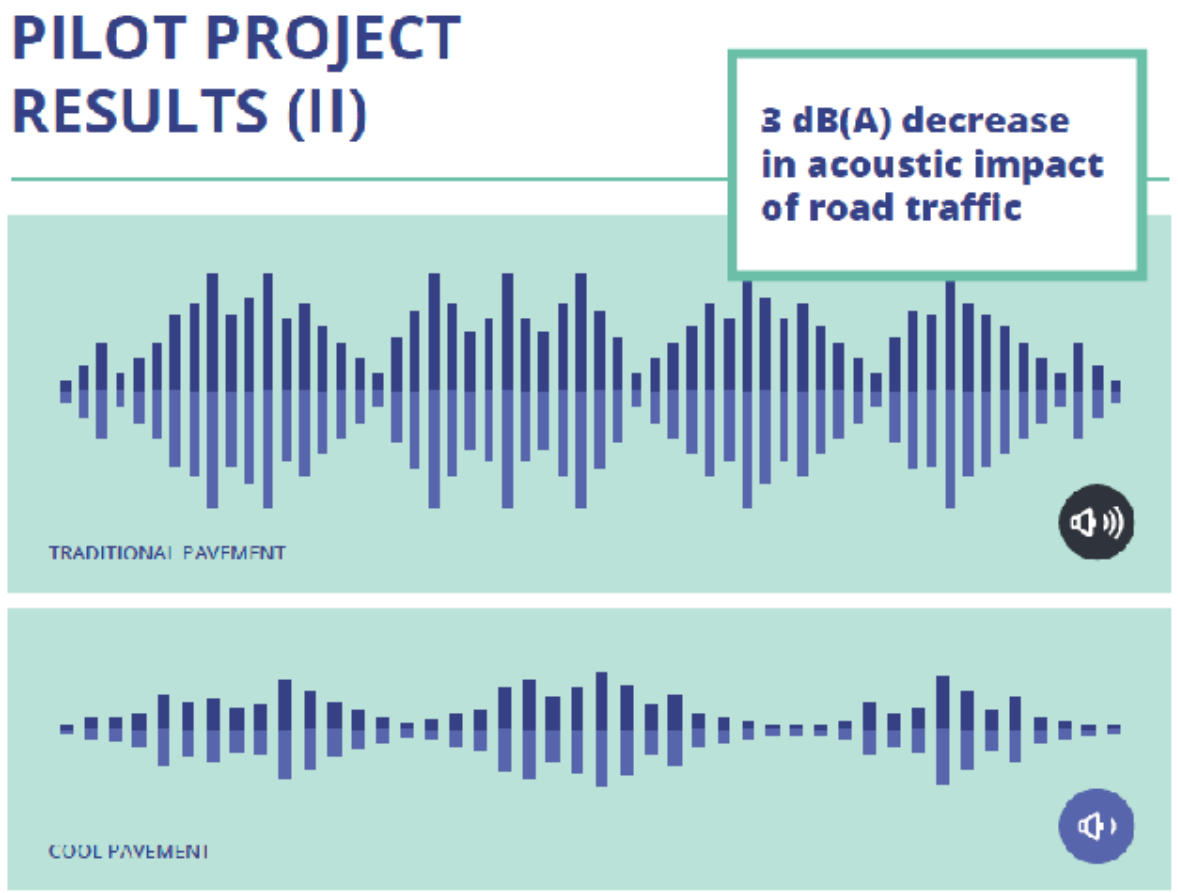
4. REZULTATI: UČINKI GLEDE HRUPA

Hrup zmanjšan za 3 dB(A)

Hladni asfalt



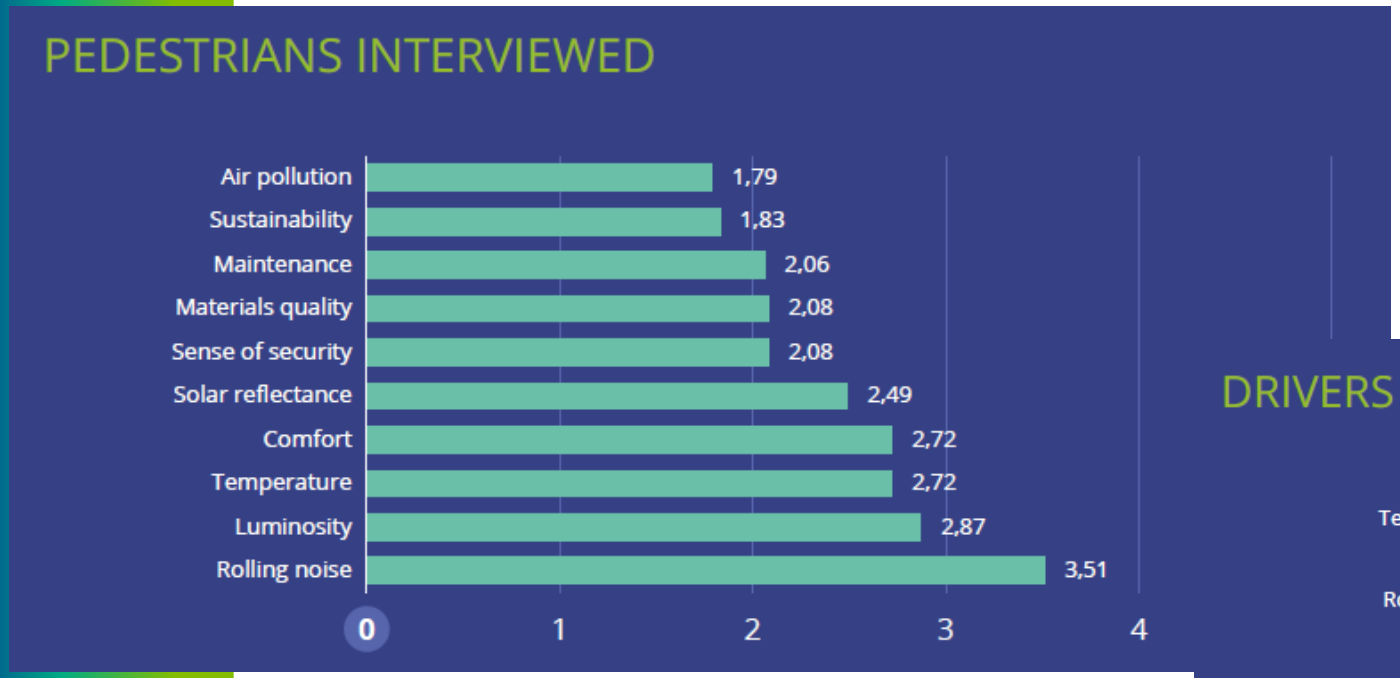
Tradicionalni asfalt

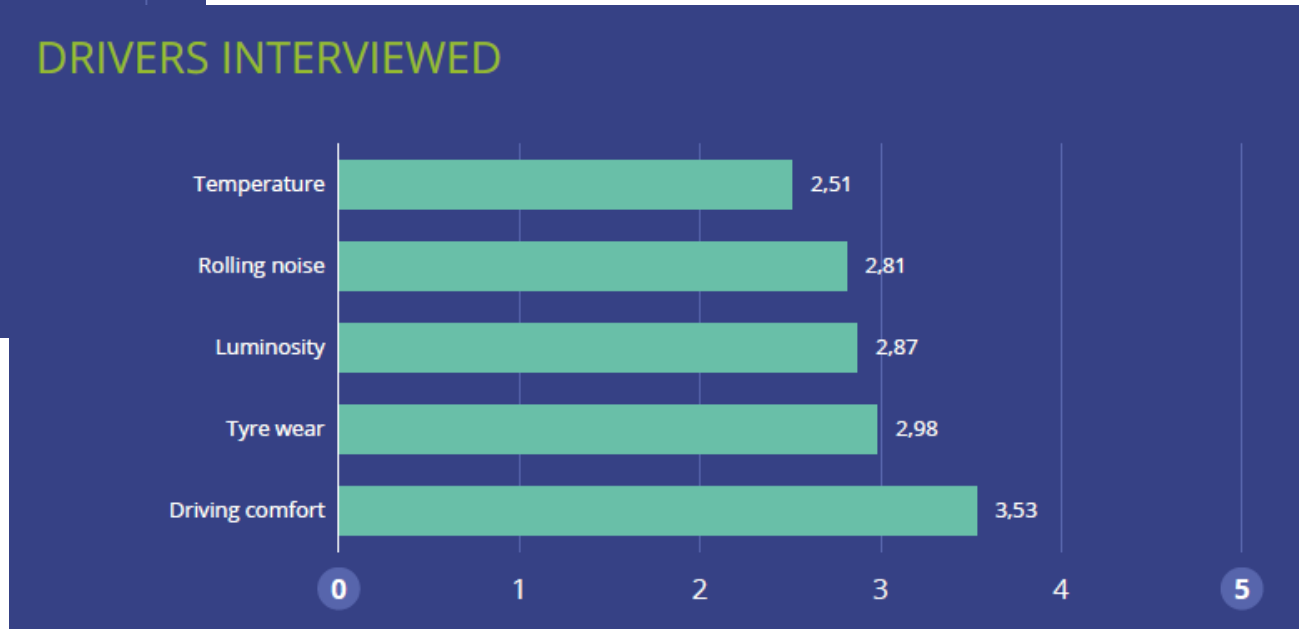


4. REZULTATI- POVZETEK

365 DNI PO IZVEDBI	tradicionalni	HEATLAND	
Povprečaan sprememba	7 – 11 °C		
Maksimalna sprememba	15 °C		
Sončna odbojnost	8 %	23 %	+ 170 %
svetilnost	1 cd/m^2	2 cd/m^2	+ 100 %
hrupnost	57 dB(A)	54 dB(A)	- 3 dB(A)
emisije	-	-	Not relevant

4. REZULTATI- odzivi glede primerjave hladnih in tradicionalnih površin s strani pešcev in voznikov





4. REZULTATI- izvedba demonstracije v Barceloni

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HEATLAND LIFE
@HeatlandL

Replication works in #Barcelona!! Outstanding final look!! Impressive #teamwork!! @bcn_ajuntament @CTCON #CHM @LIFEprogramme @ComisionEuropea

Francisco Moral and 3 others

1:14 pm · 27 Nov 2021 · Twitter for Android

HEATLAND LIFE Retweeted

Ajuntament de BCN @bcn_ajuntament · 29 Nov

Seguim lluitant contra el canvi climàtic.

Instal·lem un nou paviment al carrer del Torrent de l'Olla que permetrà reduir la temperatura ambiental i de l'asfalt, així com el soroll de la zona.

#EmergènciaClimàticaBCN

Eloi Badia Casas and HEATLAND LIFE

4 15 30

Show this thread

4. REZULTATI- možnosti uporabe

HEATLAND LIFE Retweeted

Centro Tecnológico de la Construcción @CTCON · 26 Nov

En @CTCON tenemos el proyecto @HeatlandL un asfalto reflectante capaz de disminuir la temperatura media de la superficie del pavimento entre 7 y 11 grados, así como rebajar en 3 dB (A) nivel del ruido ambiental de la zona. ctcon-rm.com/es/proyectos/I...

Curro Lucas @curro_lucas · 25 Nov

¿Sabías que se puede emplear "asfalto blanco" en el pavimento de los túneles carreteros? Con ello, se puede mejorar la visibilidad dentro.

Vemos como se conduce por un Túnel de la A7 de Luxemburgo 🇱🇺

#interCILA

HEATLAND LIFE Retweeted

Centro Tecnológico de la Construcción @CTCON · 26 Nov

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#interCILA

MOŽNOSTI ZA PRENOS TEHNOLOGIJE V SLOVENIJO

- V sodelovanju z zainteresiranimi partnerji v Sloveniji se lahko naredi demonstracijski objekt tudi v Sloveniji
- Matematični izračuni učinkov za mikroklimatske pogoje na lokacijah v Sloveniji
- Informiranje in usposabljanje glede obvladovanja učinka mestnih toplotnih otokov
- Povezovanje z drugimi projekti in aktivnosti na temo UHI
- Prenos HEATLAND tehnologije: licenca, tehnološka podpora pri proizvodnji

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IZZIVI KOMERCIALIZACIJE V SLOVENIJI

- **Nepoznavanje rešitve** – premalo promocije in informiranja o HEATLAND rešitvi, predvsem investitorjev in investicij z veliko odprtimi, izpostavljenimi površinami (trgi, parkirišča, ceste)
- Pilotna izvedba z monitoringov učinkov v Sloveniji
- Testiranje na zmrzlinsko odpornost
- Tehnologija za izvedbo – oprema za proizvodnjo in izvedbo samo za uporabo HEATLAND
- **Lastnik tehnologije zainteresiran za prenos HEATLAND tehnologije**: licenca, tehnološka podpora pri proizvodnji

Več informacij

vladimir.gumilar@sgg.si

Slovenski gradbeni grozd – GIZ
(Construction Cluster of Slovenia)

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