



Using plastic waste in construction: Recycled medical equipment to improve concrete

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Universidad Tecnológica
Nacional

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INGLES II - CIVIL ENGINEERING

2023

Introduction

Contextualization

Large amounts of plastic-based personal protective equipment (PPE) for health workers, as well as face masks for the general public, have been used to combat the spread of COVID-19.



Objective

The aim of this paper is to introduce an alternative material for infrastructure building that incorporate plastic waste



MAP OF THE PRESENTATION

1

Current
Statistics and
Environmental
Impact of DMFM
and PS

2

Application of
Plastic Waste
in Concrete

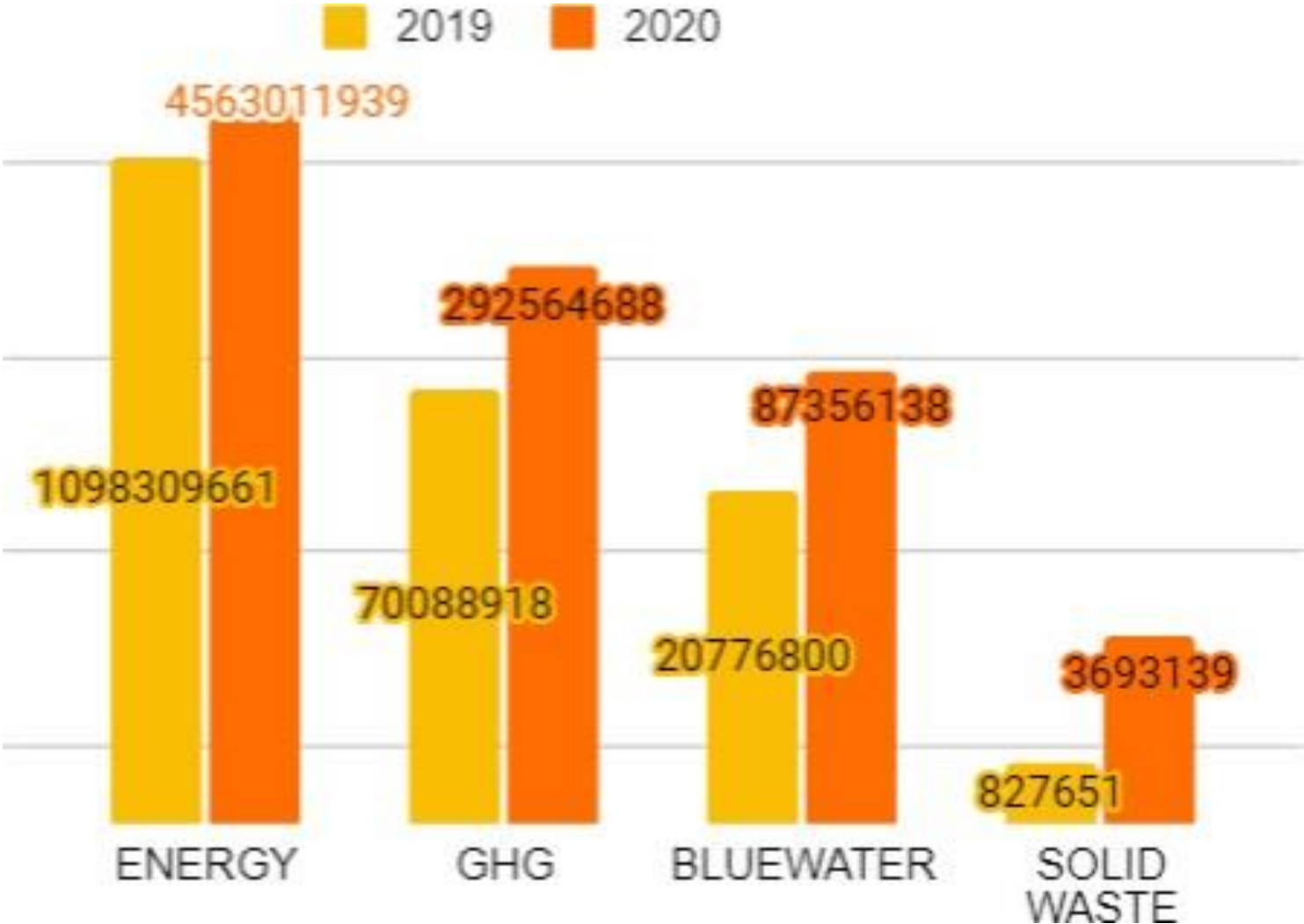
3

Analysis of the
Research

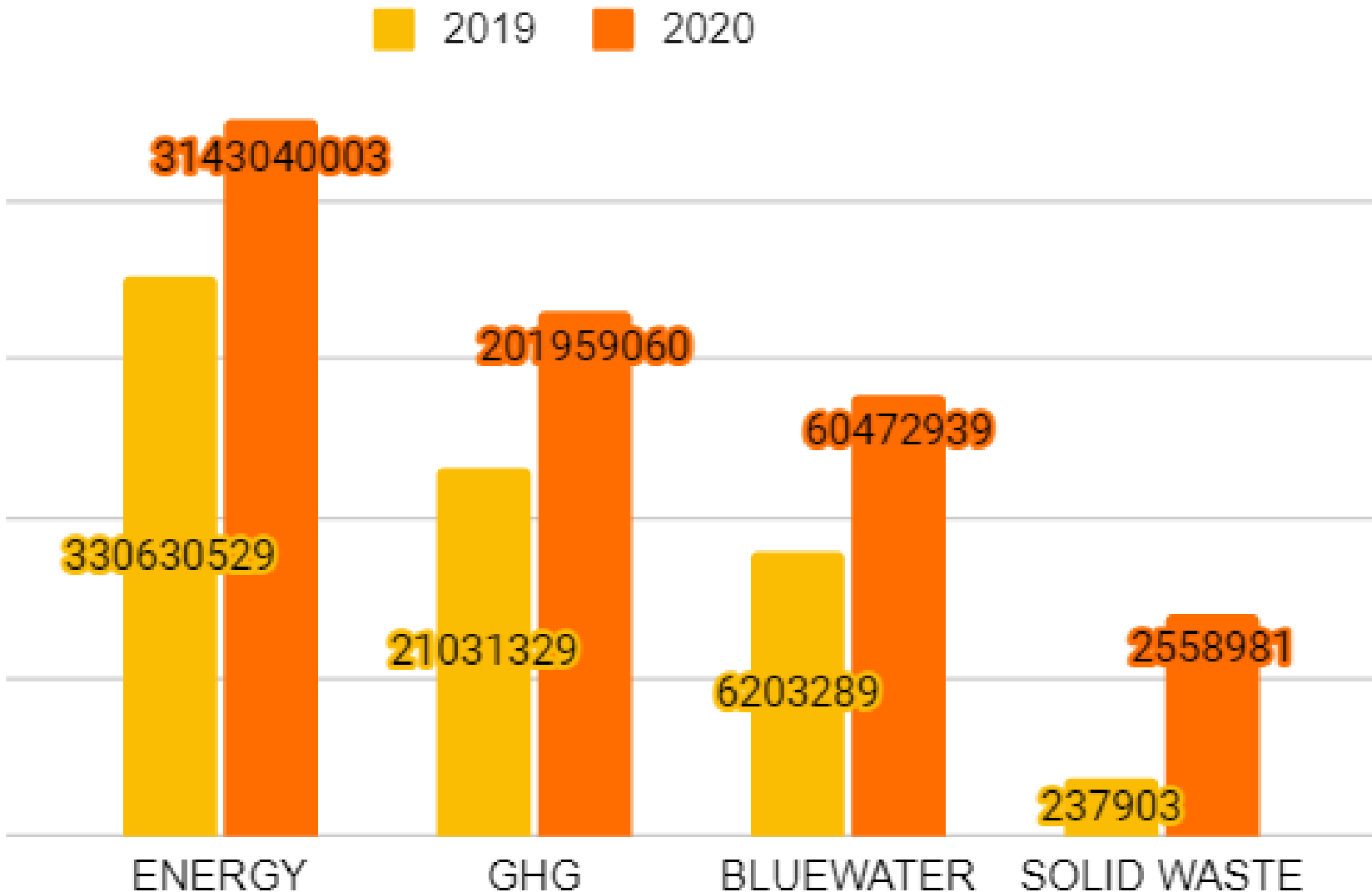
Current Statistics and Environmental Impact of DMFM and PS

DMFM AND PS CONSUMPTION IN MAJOR REGIONS

USA



EUROPE

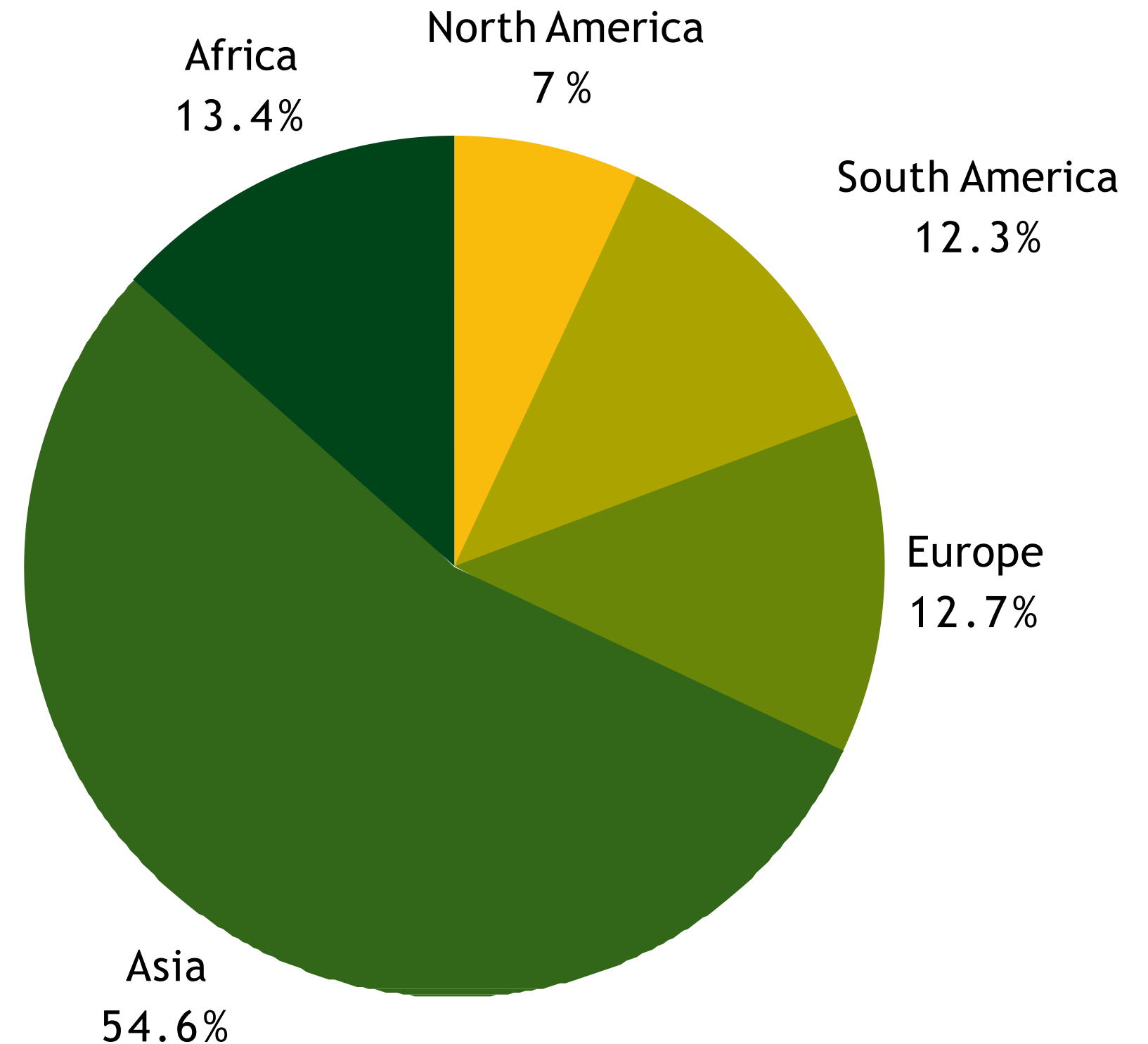


Current Statistics and Environmental Impact of DMFM and PS

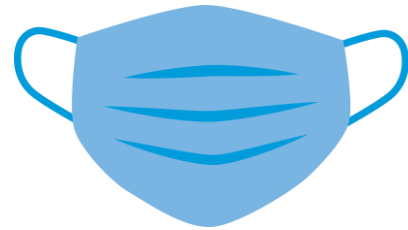
STATISTICS OF MASK WASTE

■ The current daily estimated number of DMFMs is approximately 3503.7 million worldwide.

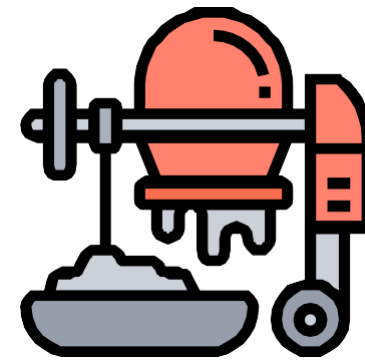
■ $Daily\ waste = 1 \times 10^{-4} \times (P_{Total} \times P_{Urban} \times A \times B)$



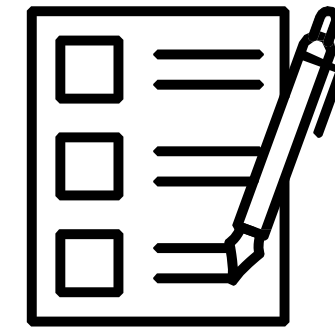
Application of Plastic Waste in Concrete



Processes to Obtain
the Polypropylene
Fibres



Mix Design, Casting
Procedures and
Specimen-Making



Testing and Results

Processes to Obtain the Polypropylene Fibers

MASKS

(EXPERIMENT N 1)

- **Ear straps and nose wire are removed**
- **Samples are cut into rectangular shapes (20x5 mm)**



PROTECTIVE SUITS

(EXPERIMENT N 2)

- **Zippers and elastics are eliminated**
- **Samples are cut into rectangular shapes (20x4 mm)**



Mix Design, Casting Procedures and Specimen-Making

EXPERIMENT N 1



Ordinary Portland Cement



River Sand



Crushed stone and recycled concrete



Polypropylene Fibers



Superplasticizer

Mix Design, Casting Procedures and Specimen-Making

EXPERIMENT N 2



Composite Portland Cement



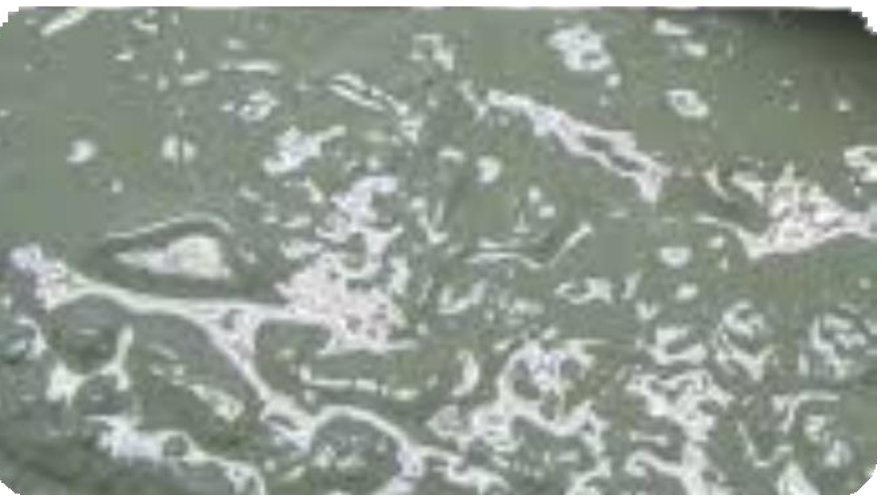
River Sand



Crushed limestone



Polypropylene Fibers



Water-reducing
aditive

Mix Design, Casting Procedures and Specimen-Making

EXPERIMENT N 1

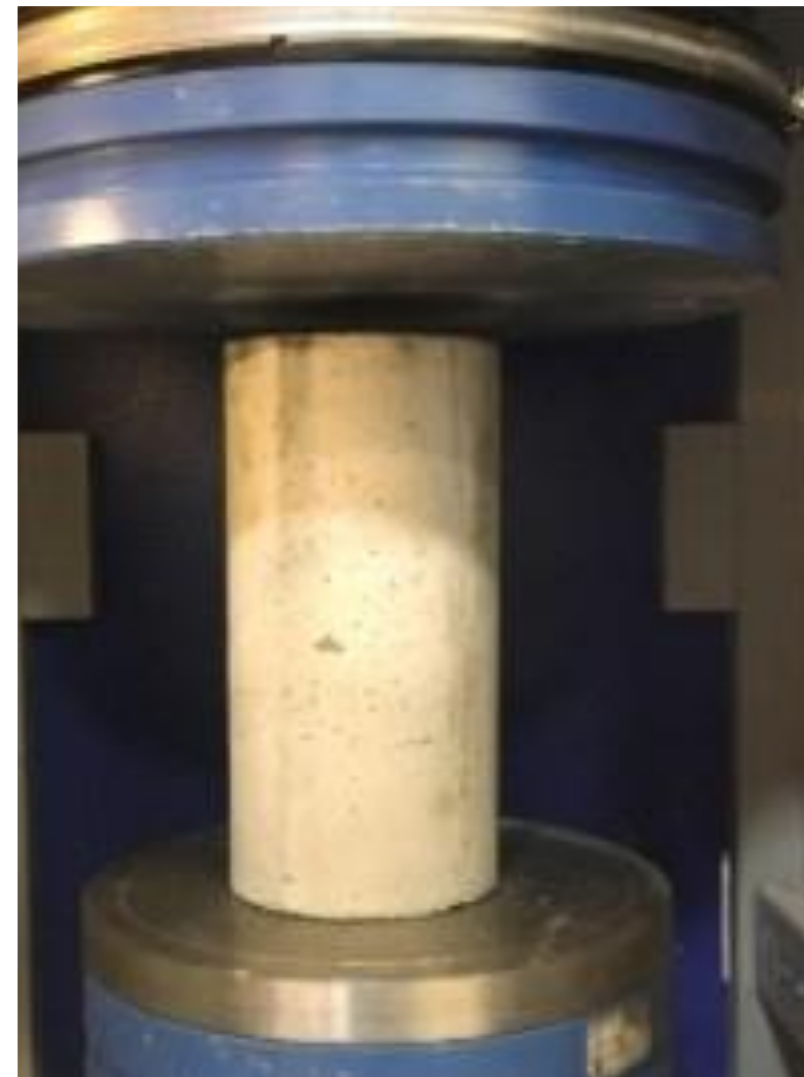
Mix ID	Fiber dosage (%)		Binder (kg/m ³)		
	DMFM fiber	Basalt fiber	OPC	FA	GGBFS
M0	0.00	0.00	489	-	-
M1	0.00	0.00	391	33	65
M2	0.10	0.00	391	33	65
M3	0.20	0.00	391	33	65
M4	0.00	0.25	391	33	65
M5	0.10	0.25	391	33	65
M6	0.20	0.25	391	33	65
M7	0.00	0.50	391	33	65
M8	0.10	0.50	391	33	65
M9	0.20	0.50	391	33	65

EXPERIMENT N 2

Group Number	PSF (% by Volume)
PS0	0
PS2	0.2
PS4	0.4
PS6	0.6
PS8	0.8
PS10	1.0

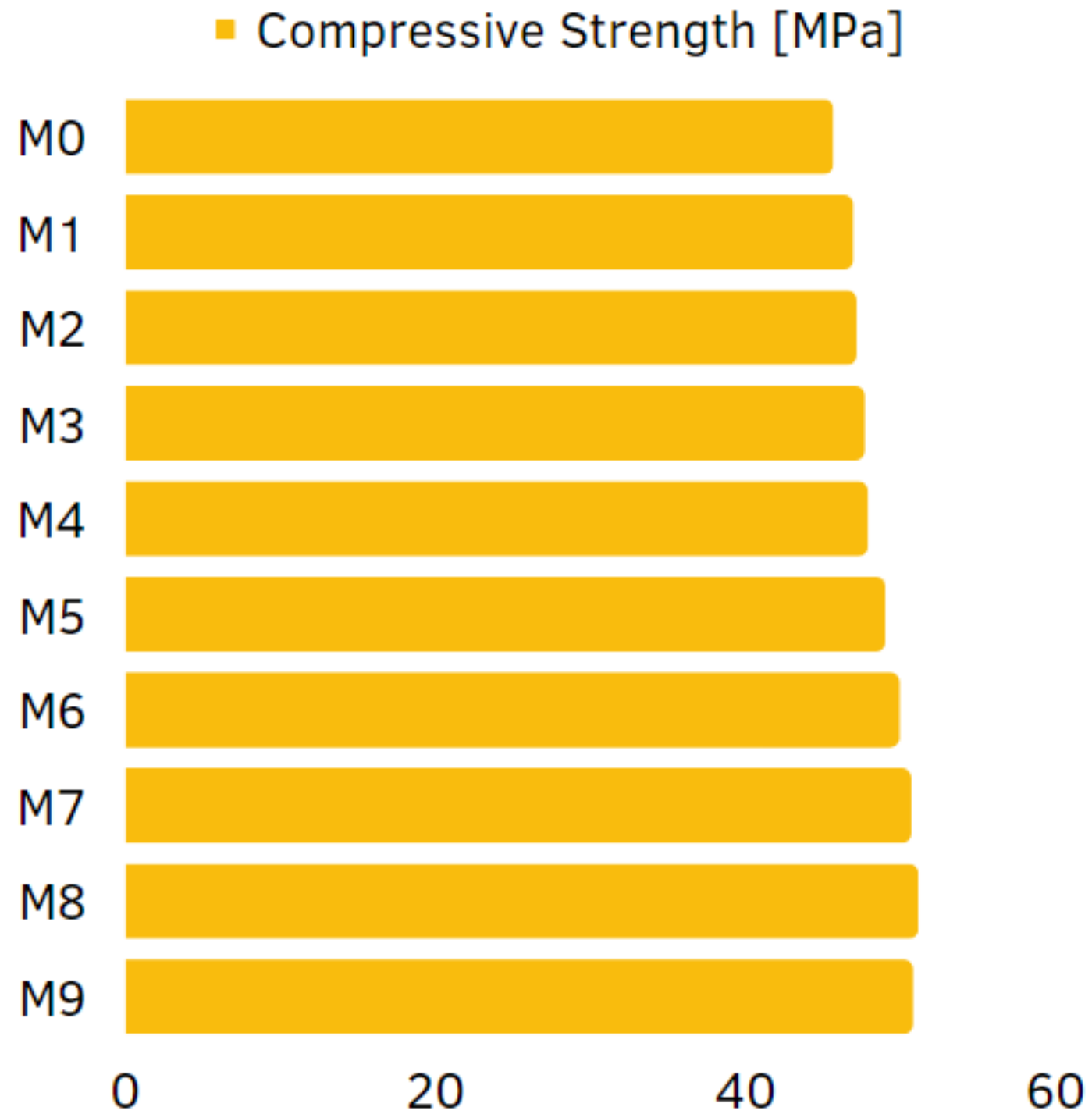
Testing and Results

- Compressive strength test
 - Cylindrical specimens (Experiment N 1)
 - Cubical specimens (Experiment N 2)

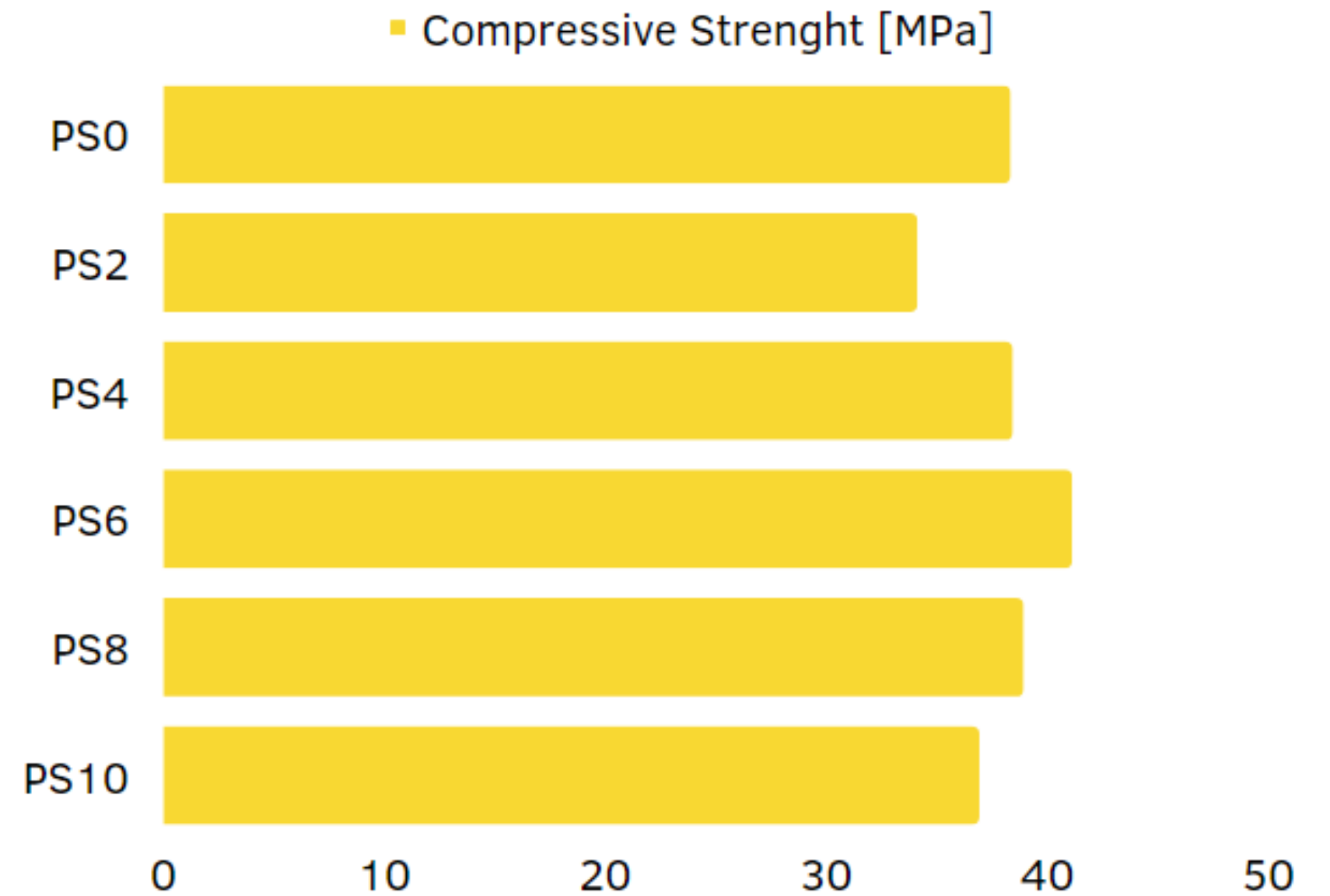


Testing and results

EXPERIMENT N 1



EXPERIMENT N 2



Analysis of the Research

■ Improved
Compressive
Strength of
Concrete

■ Environmental
and Economic
Benefits

■ Desinfection
of Recycled
Equipment

■ Higher
performance
with minerals
and basalt
fibers addition



Conclusion

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THANKS FOR LISTENING!



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Career Path

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Academic Year

2023



Subject

INGLÉS II



Teacher

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