



FRAGMENT



Problem of Waste Glass

In this project, we will be addressing two key challenges that are prevalent not only in Serbia but also in Southeast Europe.

1. The issue of large quantities of waste glass ending up in landfills due to the lack of proper glass recycling infrastructure.
2. The increasing demand for modern and eco-friendly construction materials that are sustainable in nature.

In the Balkan region, most glass bottle and jar manufacturers have closed down in the last 20-30 years. As a result, exporting waste glass has become the only way to manage it. However, the collection and transportation costs are quite high, around 50 € per ton, while the purchase price hardly reaches 10 € per ton. This has resulted in a majority of waste glass ending up in landfills, which in turn increases the costs of municipal waste management, decreases the lifespan of landfills, and significantly raises the carbon footprint of glass products.

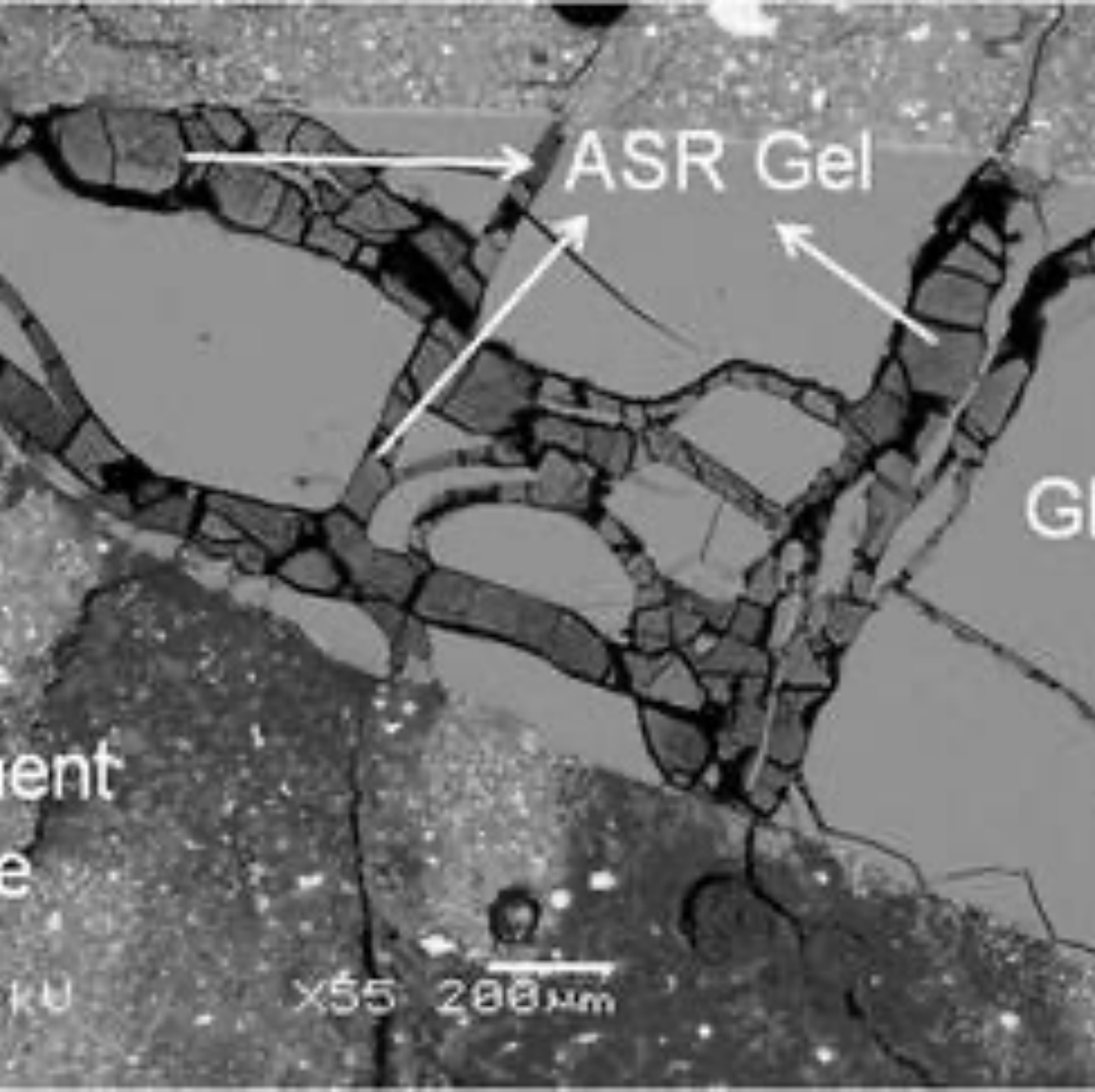


Solution

Our idea is to use waste glass as a raw material for the fabrication of sheet-form building materials or panels. These panels have a wide variety of applications, such as use for the kitchen countertops, conference tables, window sills, tabletops, bar tops, shower pans, and the like.

Such panels are conventionally fabricated with a high cement content using an aggregate, such as rock, gravel, sand or crushed marble. Our idea is to use waste glass as aggregate instead of rock, gravel and sand. However, the difficulty with substituting glass for sand or aggregate in this application is that glass normally results in the loss or degradation of the mechanical and chemical properties needed for solid surface panels. Overcame the drawbacks of using glass in this application by providing a new cementitious composition and method for making a solid surface building panel that has a high percentage of glass (75%), but which achieves the mechanical, chemical and thermal properties required of such panels.





The Technology/ Innovation

Mixing glass aggregates and cement can lead to a phenomenon known as "concrete cancer" due to the chemical reaction between glass and cement (alkali-silica reaction). Our project aims to address this issue by introducing a new cementitious composition and method for creating solid surface building panels with a high glass content. These panels will possess the necessary mechanical, chemical, and thermal properties required for such applications.

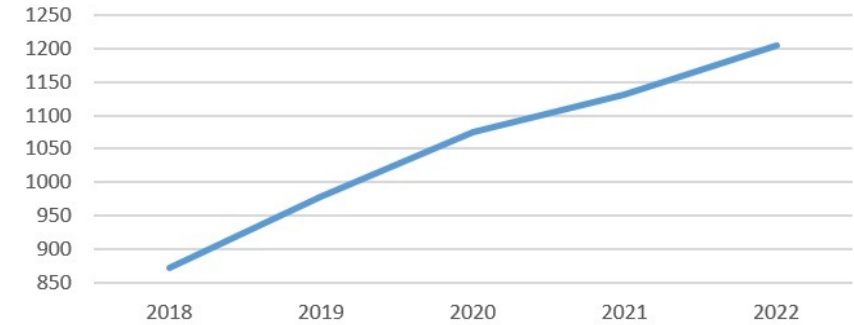
The primary innovation of our project lies in the use of polymers and pozzolans as additives, which prevent the occurrence of alkali-silica reaction while also maintaining excellent aesthetic properties and the ability to polish the surface to a high gloss. Our product has mechanical properties that are comparable to those of its competitors, and it is far more thermally stable than polymer composites. Additionally, it is resistant to damage from sunlight, whereas polymer composites tend to yellow. Compared to natural stone, our new product is less susceptible to staining from acidic substances like vinegar and lemon, and it has greater crack resistance.



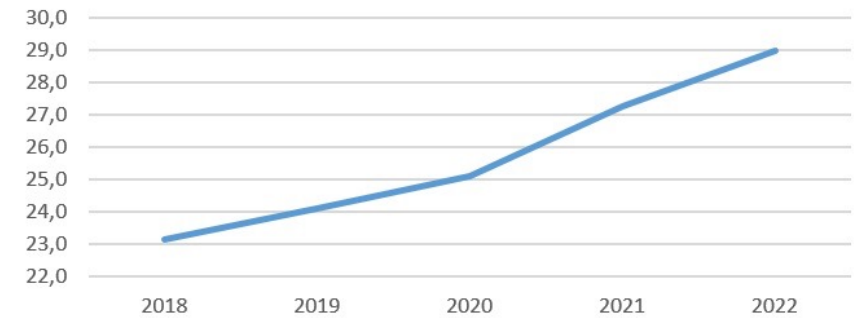
Market Size

Our primary target market is the construction industry, specifically for high-end residential and business projects. In Serbia, there is a demand for approximately 38,500 m² of luxury panels, while in the Balkan region, the demand is around 219,000 m² with a growth rate of 15%. In 2023, we plan to expand into the EU market, which has a demand of around 9,180,000 m² and a consistent growth rate of 6% over the last decade. Currently, the market is dominated by natural stone (such as marble, granite, and onyx) and polymer composites.

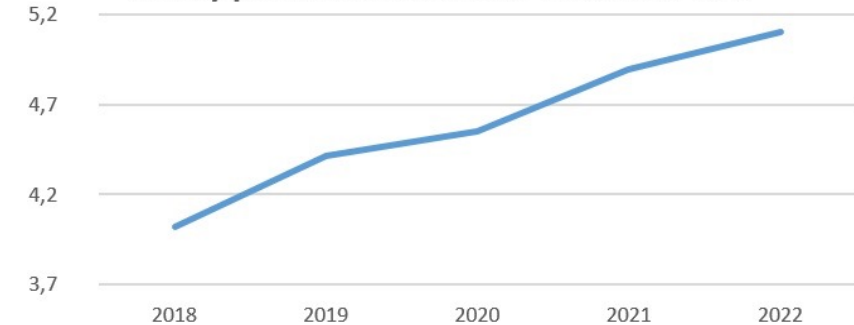
Luxury panels sold in EU in millions of €



Luxury panels sold in Balkans in millions of €



Luxury panels sold in Serbia in millions of €

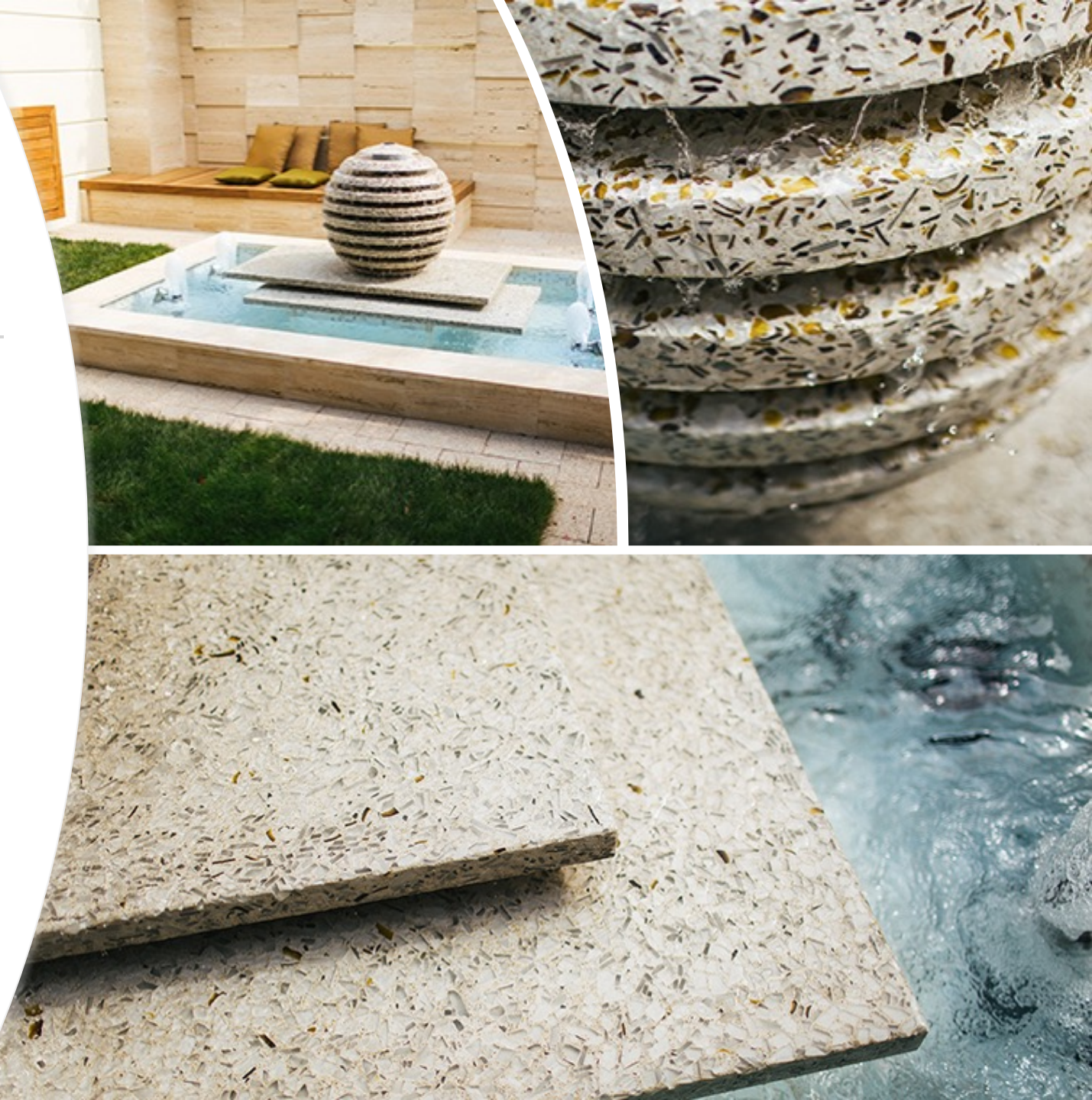


Business model

Our primary target market consists of architects, designers, carpenters, and other professionals in the construction industry. The second group comprises wholesalers and furniture manufacturers. Our eco-friendly product boasts unique aesthetic properties that transform waste glass into beautiful and sustainable building materials for homes and offices. Notably, our customers can achieve higher profit margins when selling our product compared to natural stone or polymer resins.

Based on our preliminary calculations, the cost of acquisition for the first group of customers will be approximately 150 € for the first two years and then drop to around 60€, with a lifetime value of 80,000€. In contrast, the cost of acquisition for wholesalers and furniture manufacturers will be higher, ranging from 2000-3000€, with a lifetime value of 300,000 €.

We do not anticipate any significant barriers to entering the EU market.





Commercialization Strategy and Revenue Potential

Fragment is generating a profit through the sale of our products. In the future, we may also license our technology or sell our know-how.

We have defined our starting product price by taking into consideration the production cost, marketing cost, future expansion costs, as well as the price of competing products. Our calculations have shown that we can achieve a profit margin of 60%-75% with prices ranging from 180€ to 320€. However, our entry price will likely be even higher because customers are willing to pay more for our unique product.

For the first two to three years, we plan to focus on online marketing and attend fairs, specifically construction and furniture fairs. Additionally, we plan to visit potential clients and give presentations about our new product while providing them with a sample box.

For the regional market, we plan to develop our own distribution channel while also working with wholesalers. We will reach the European market through wholesalers and furniture manufacturers.



Competition overview

The main players in the market are producers and wholesalers of natural stone (marble, granite, onyx, etc.) and contemporary composite materials (acrylic, epoxy, and polyester composites).

Fragment panels has better performances than marble and onyx and similar like granite. On the other hand, our unique and new aesthetic properties will give us necessary edge for this market niche. Also it is important to note than we market our product as eco-friendly material that saves environment by using more than 75% recycled glass while natural stone is dig from nature and, thus, it is not sustainable. Additional, advantage of our material is that is less prone to stains from acids (vinegar, lemon, etc.) compared to natural stone.

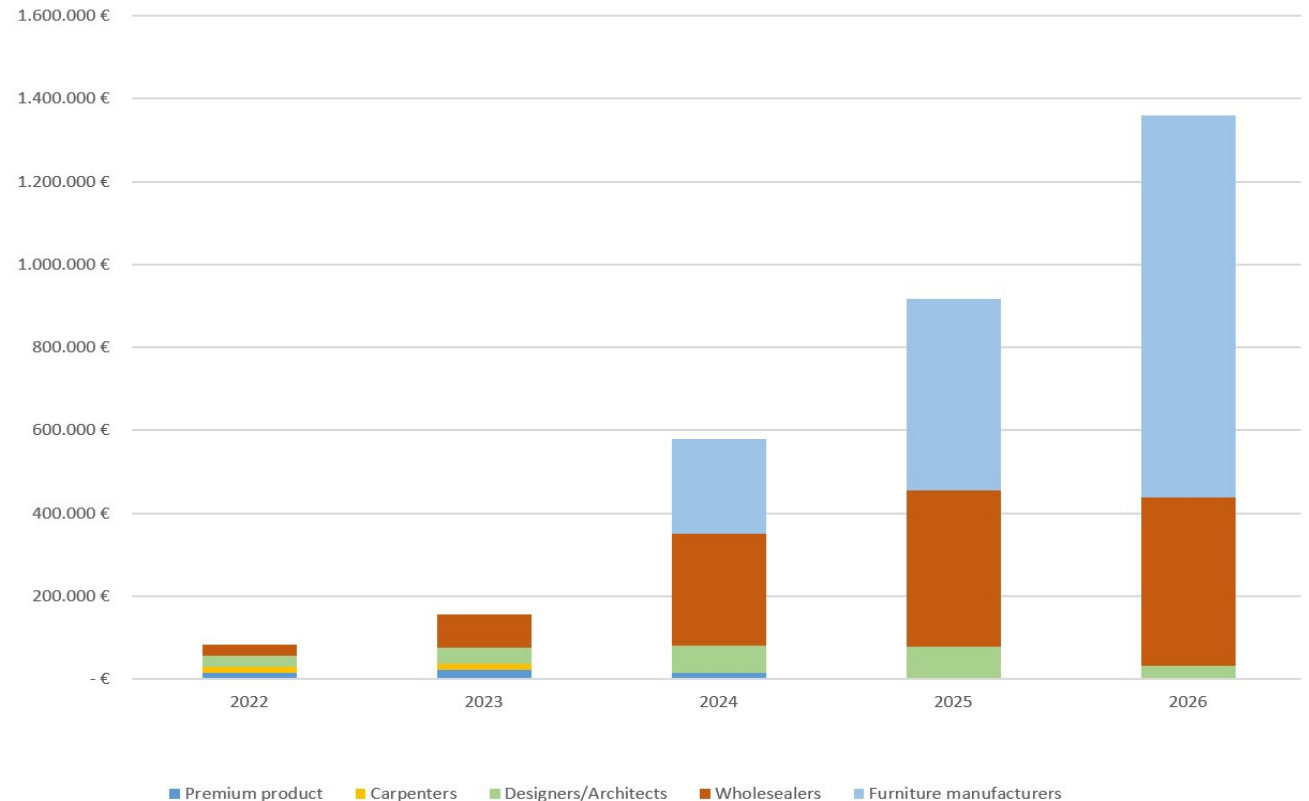
Polymer composite materials possess unique feature can be moulded into various forms. However, this is only important when making kitchen countertops together with sinks. In other features like UV resistance and heat resistance, our material much better.



Financial projection

So far, we have received a grant in the amount of €79,830 from the Innovation Fund of Serbia, through a loan from the World Bank to the Republic of Serbia. In addition to the grant, we have made a private investment of €85,000, which we have used for research and development, as well as for the laboratory, equipment, and production facility located in the Park of Science and Technology in Čačak.

Projected revenue generated by costumers groups



Financial forecast 2023-2027					
	2023	2024	2025	2026	2027
Total Revenue (EUR)	83.000	156.000	580.000	917.000	1.360.000
Profit (EUR)	52.000	94.000	306.000	472.000	687.000

Team



Dr. Pavle Spasojević is a Chemical Engineer with a PhD and a Master's degree in Chemical Engineering from the University of Belgrade. He is an Associate researcher at the Faculty of Technology and Metallurgy, with experience in several research projects funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia, as well as the Innovation Fund of the Republic of Serbia and the European Bank for Reconstruction and Development. Dr. Spasojević has authored over 60 scientific publications and is knowledgeable in a variety of polymer characterization techniques. His research interests include eco-friendly and sustainable enzymatic polymerizations and the development of bio-based films for the food packaging industry.




Pavle Milošević is an entrepreneur and sustainability advocate with a diverse educational background, including a degree in economic analysis and politics from the Faculty of Economics in Belgrade, and studies in international economics and the Chinese language at the University For International Business and Economy in Beijing.

Through his work managing projects in the chemical industry and his travels through China, Pavle developed a strong commitment to sustainability and environmentalism. In 2019, he founded Fragment Incorporated doo, a start-up that produces high-quality glass panels using recycled "waste glass" and innovative technology that prevents an alkali-silicate reaction known as the "cancer of concrete." The Fragment team has received funding and support from a range of institutions, including Innovation fond Serbia, the Ministry of Education, Science and Technological Development, and the World Bank.



Marija Marković is an interdisciplinary artist and activist, known for her work in video, painting, drawing, installation, and sculpture. She holds a Master's degree from the Faculty of Fine Arts in Belgrade (2011) and a Master's degree from the Parsons School of Design - The New School in New York (2017).

Marković is actively involved in promoting environmental awareness and protecting ecology through her work as a co-founder and activist with the non-profit organization "Zeleni talas" ("Green Wave"). She is also the co-founder of Fragment Inc, a company dedicated to manufacturing new materials from recycled glass. Overall, Marković's work is a testament to her commitment to both the arts and environmental sustainability, and she continues to push the boundaries of what is possible in both fields.

A still life photograph showing two glasses filled with a dark amber liquid, likely honey or a similar natural product, and a clear glass bowl filled with almonds. The items are placed on a white terrazzo table. In the background, there are some green plants and a colorful abstract painting. The overall scene is well-lit and aesthetically pleasing.

We will use voucher from X2.0 OC#1 to:

1. Internationalization/Soft-landing: Support finding local partners or one on one mentorship. At this stage of entering the EU market, we will need help to make local connections with our "ideal customer" and make it easier to enter the market.
2. Deeptech/Scientific aspects: Access to DIHs, R&D centers, test laboratories, and promotion in their regions. Tech consulting - Collaboration with scientific institutions will help us optimize our product formulation and production process. Additionally, it will aid us in fully understanding the chemical mechanism of interactions between various additives, which eliminates negative glass/cement reactions. This will allow us to protect our findings with a patent.
3. We will also use a travel voucher to attend one sustainability fair and one international furniture fair.



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THANK YOU!

