SILVAPHENE- FROM WASTE TO ADDITIONS OF ANTI-TARNISH STERLING SILVER FOR SUSTAINABLE JEWELRY.

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SILVAPHENE ALLOY

Driven by a passion to preserve the cultural heritage of nielloware in my country, this research integrates advanced metallurgy and craftsmanship to address two critical challenges: replacing lead in niello bars and developing anti-tarnish alloys for sterling silver, which is the existing problem for a long time. Traditional nielloware production, which lead as a primary component flow easily into the groove of the products, posed significant environmental and health risks. By innovating lead-free niello bars, we not only protect artisans and the environment but also preserve this iconic craft for future generations. However, the declining number of craftsmen threatens the preservation of this cultural heritage, underscoring the urgent need for innovative solutions to sustain and revitalize these traditions.

The journey began with metallurgical research on the microstructure and properties of niello bars, using tin (Sn) as a replacement for lead (Pb) in 2010. This innovation successfully replaced traditional niello; however, the viscosity of the lead-free alloy differed due to variations in the flow point, making it challenging for craftsmen to adapt to the new material. To address this, I initiated training programs for students and local villagers to familiarize them with the products. The goal was to foster appreciation for and sustain the production of heritage items. A pilot plant was established to standardize the production of lead-free niello bars, ensuring consistent quality and scalability. The methods were validated by proving that the microstructure and crystallography, characterized through X-ray diffraction patterns, adhered to industry standards across various product sizes.
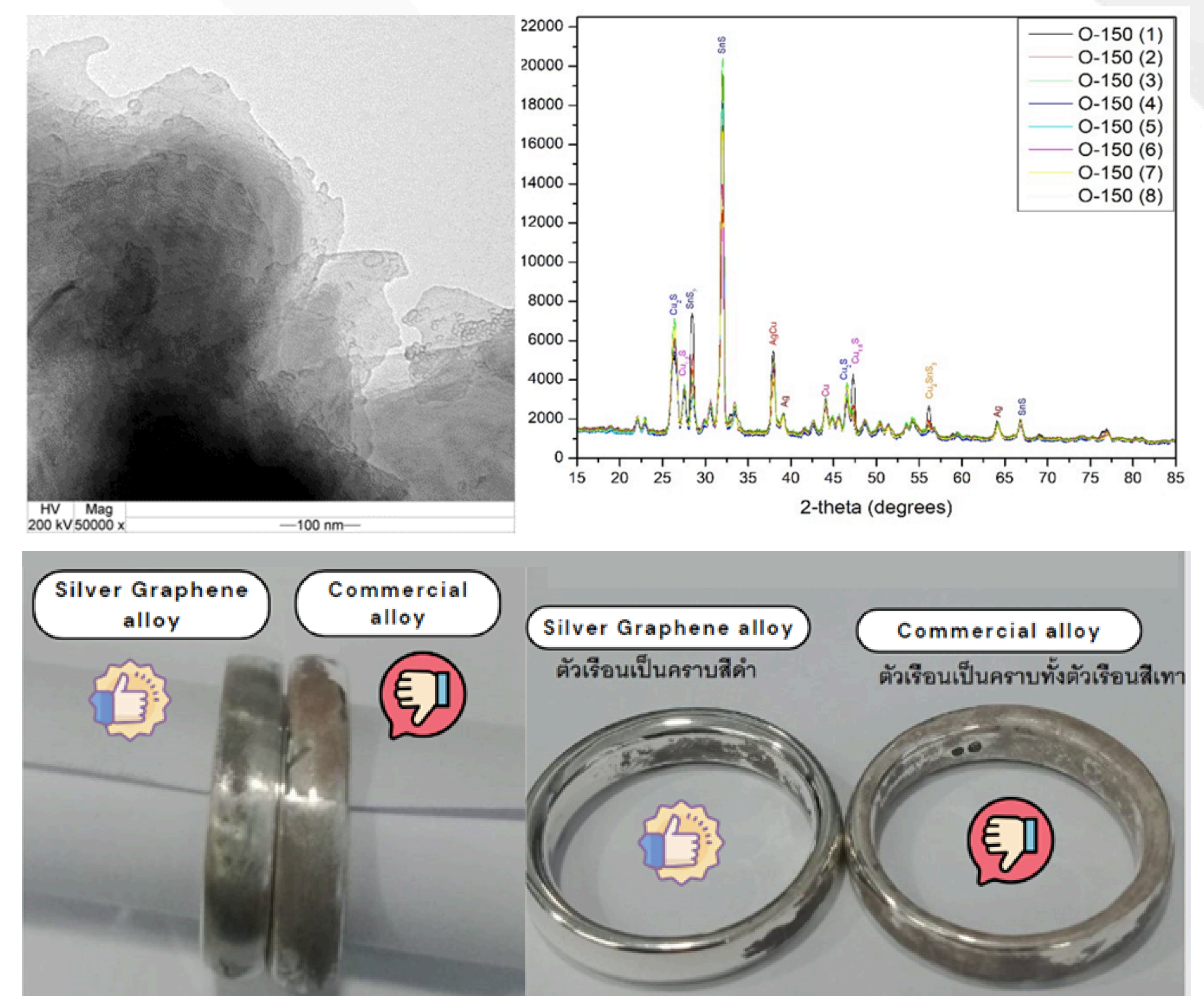
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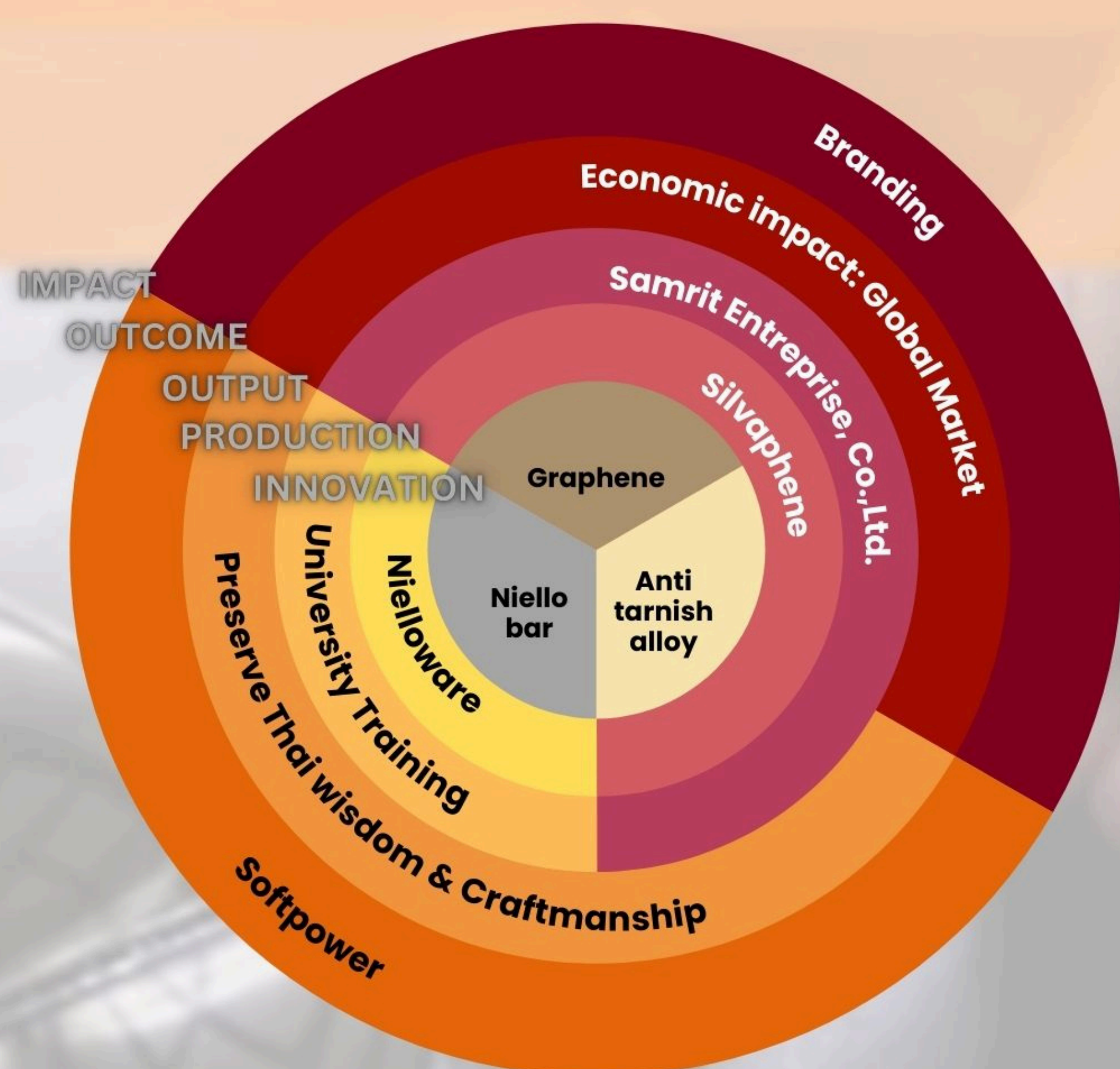
In parallel, research uncovered durability issues with traditional sterling silver alloys combined with nielloware, particularly regarding tarnishing. To resolve this, a breakthrough innovation emerged: the combination of sterling silver with graphene. This new alloy demonstrated superior anti-tarnish properties and quickly attracted significant market interest. While many types of graphene exist, we chose to use a novel innovation—graphene captured from the air—to align with eco-friendly goals. This project involved collaboration between two university enterprises: Chulalongkorn University, which provided graphene, and Srinakharinwirot University, which developed the sterling silver alloy. Our research groups explored various sources of graphene and alloy recipes, ultimately developing the first commercial alloy under the brand name "Silvaphene." This innovation is now ready for commercialization.

The dual innovations from this project—lead-free niello bars and anti-tarnish sterling silver alloys—highlight the synergy between cultural preservation and market-driven sustainability. While lead-free niello bars safeguard the legacy of traditional craftsmanship, the anti-tarnish alloys offer significantly higher profit potential due to their broad commercial applications and global market demand. Recognizing this, I propose a social enterprise business model where profits from the anti-tarnish alloy are reinvested into initiatives to preserve traditional craftsmanship. By funding training programs, supporting artisan communities, and promoting cultural awareness, this model ensures that the heritage of nielloware continues to thrive sustainably. This approach not only preserves culture but also strengthens economic resilience within the community, creating a self-sustaining ecosystem where tradition and innovation coexist harmoniously.