BIOKRETE

BUSINESS PLAN

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Executive Summary

BioKrete is committed to pioneering sustainable synthetic biology solutions for coastal protection in Africa. Our mission is to develop biocement for constructing sea defense structures that enhance coastal resilience and safeguard marine ecosystems. By innovating biocement technology, we seek to reduce the carbon dioxide emissions associated with traditional cement manufacturing, which accounts for approximately 8% of global emissions (Purton, 2024). BioKrete aims to create eco-friendly building materials that not only reduce global carbon footprint but also offer self-repairing and biosensing technologies to build resilient shorelines.

Company and Management

BioKrete is a privately owned company with a multidisciplinary team that spans expertise in synthetic biology, engineering, and entrepreneurship. Led by Dr. Elena Rosca as the primary Principal Investigator, the team consists of members well versed in hardware, software, wet-lab operations, and entrepreneurship. The management structure promotes collaboration across different fields to ensure the successful development and commercialization of our innovative biocement and coastal defense solutions.

Services

BioKrete offers two main innovations:

Pentacones: Interlocking, wave-dispersing coastal defence units made from biocement, equipped with self-healing properties and real-time sensing for pH and three heavy metals (arsenic, cadmium, mercury) -offering a smarter, longer-lasting alternative to traditional tetrapods.

Biocement: A low-carbon alternative to conventional Portland cement, reducing lifecycle emissions. It can be used to produce building blocks, pavements and other cement-based materials.

The Market

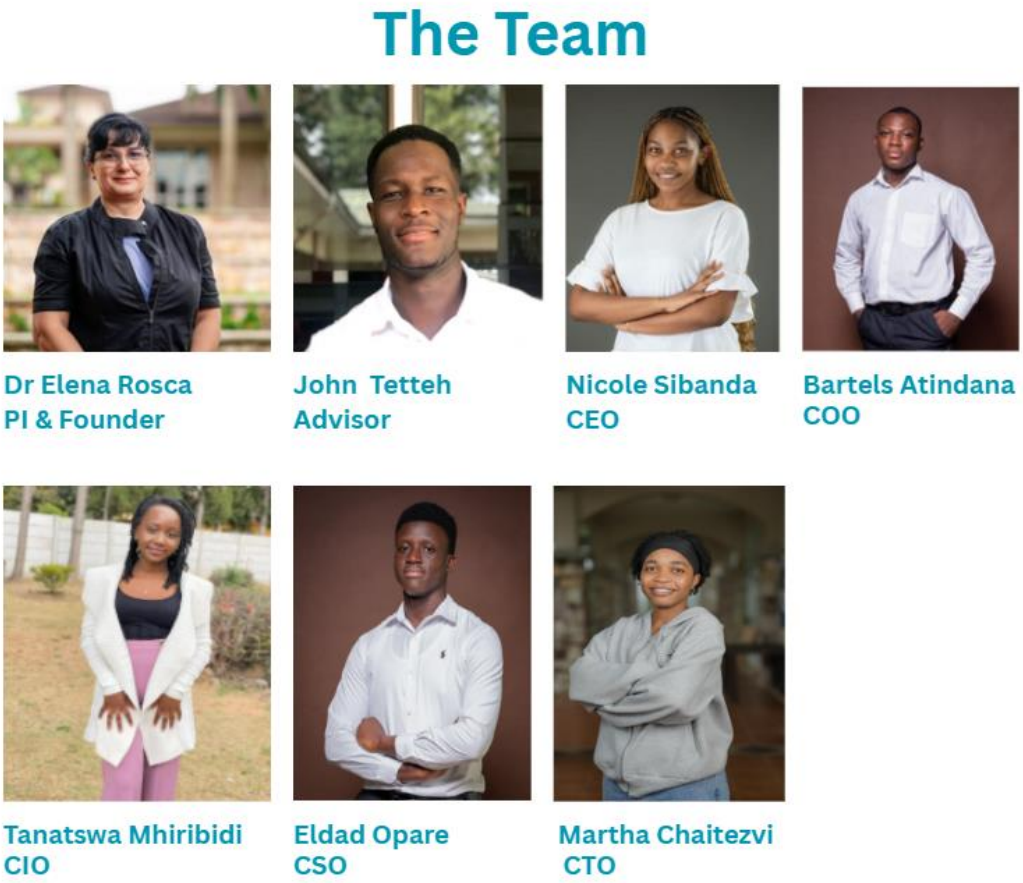
BioKrete targets several customer segments, including coastal protection companies, governments, construction companies, and cement manufacturing companies that seek to diversify into green cement. The global green cement market is valued at $39.82 billion

whereas the serviceable addressable market (SAM) is valued at $537.01 million and the serviceable obtainable market (SOM) is valued at $98 million. When it comes to the coastal protection market the TAM stands at $828 billion, the SAM at $35 billion and the SOM at $676 million.

Competitive Advantage

BioKrete differentiates itself in the market by combining synthetic biology and engineering innovation to create biocement pentacones that are stronger, more sustainable and more cost effective than the traditional tetrapods. Unlike other structures our structures have self-healing capabilities and sensing abilities helping turn an environmental liability into a useful asset.

Company Organization



Our Vision

"To lead the transformation of cement production and coastal protection by pioneering sustainable biocement technology, focusing on developing self-repairing building blocks that create resilient sea defenses”

Mission statement

"BioKrete’s mission is to pioneer sustainable cement production and coastal protection in Africa by leveraging synthetic biology to create innovative biocement for building sea defense structures, enhancing coastal resilience, and safeguarding vital marine habitats."

Objectives

We came up with a list of our core objectives as a company to be able to effectively guide our strategic direction and measure our progress and success. The diagram below shows an overview of our company's objectives.

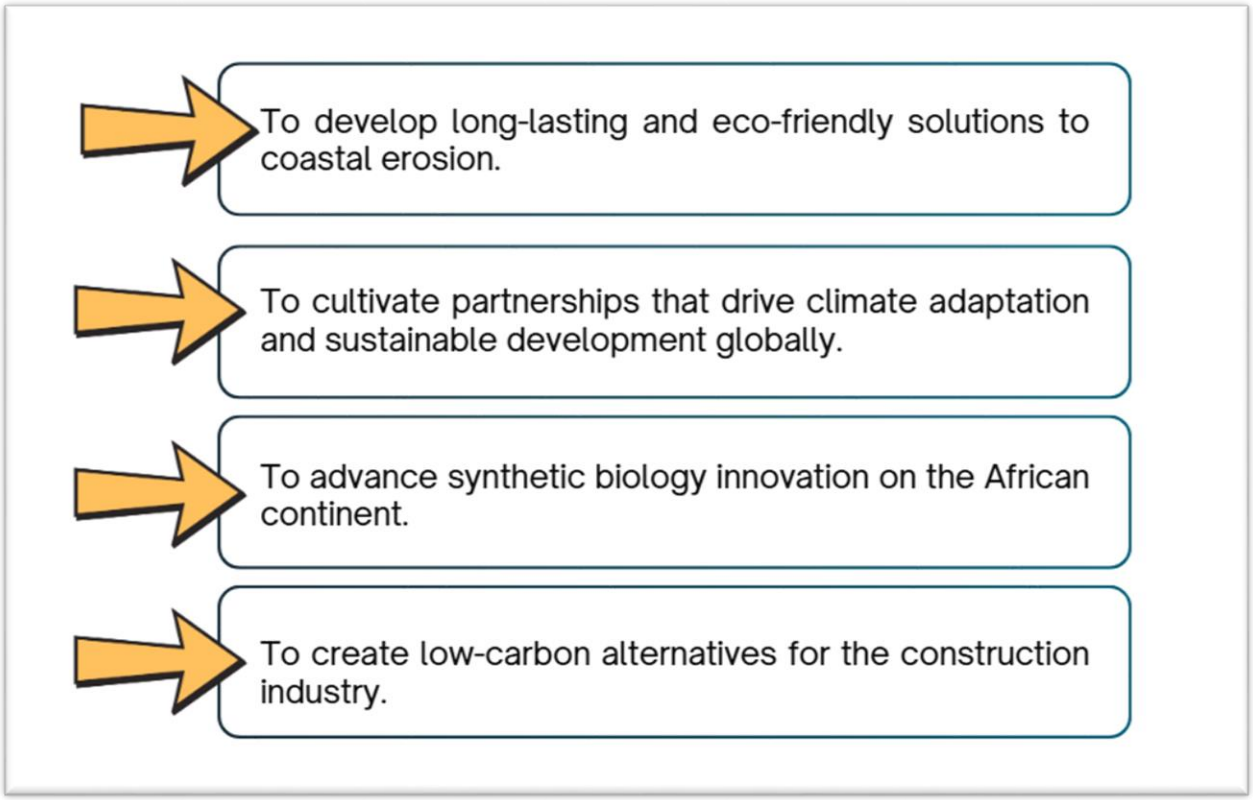


Figure 1: Company Objectives

Opportunity

THE PROBLEM

Coastal erosion is an escalating crisis for Ghana where 25% of the population lives in low lying coastal zones increasingly exposed to sea-level rise, and stronger tidal action (Dada & Morand, 2024). These changes are accelerating land loss, displacing communities and threatening key sectors such as tourism and fisheries, mounting to fiscal, social and climate adaptation costs.

At the same time, the cement industry, central to building coastal defenses, remains a climate liability responsible for about 8% of global CO_2 emissions. Cement-based materials are used in approximately 70% of construction projects worldwide (Marsh & Bernal, 2022). With global resource demand projected to double by 2050, emissions from traditional cement (0.9

tonnes of CO_2 per tonne of cement) will escalate unless lower carbon alternatives scale rapidly. Ghana alone consumes over 2.2 million tonnes of cement annually, supporting a construction sector that contributed 7.2% of national GDP in 2023 (approximately US$13.2 billion) (EPA, 2023).

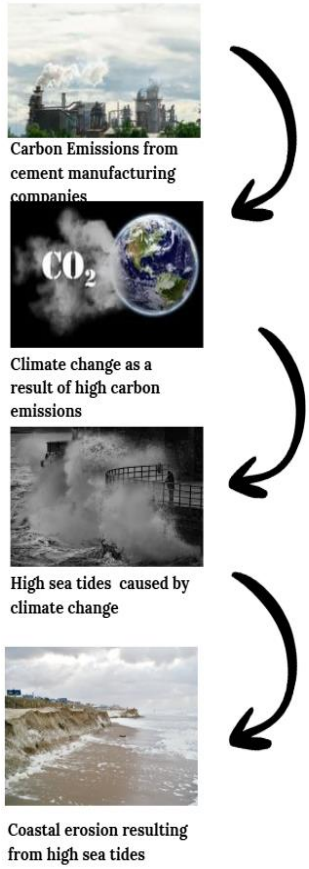


Figure 2: Problem Summary

Sustainable goals affected by the problem:

PROPOSED SOLUTION

Biokrete has developed two innovative solutions:

Pentacones: Interlocking, wave-dispersing coastal defence units made from biocement, equipped with self-healing properties and real-time sensing for pH and three heavy metals (arsenic, cadmium, mercury) -offering a smarter, longer-lasting alternative to traditional tetrapods.

Biocement: A low-carbon alternative to conventional Portland cement, reducing lifecycle emissions. It can be used to produce building blocks, pavements and other cement-based materials.

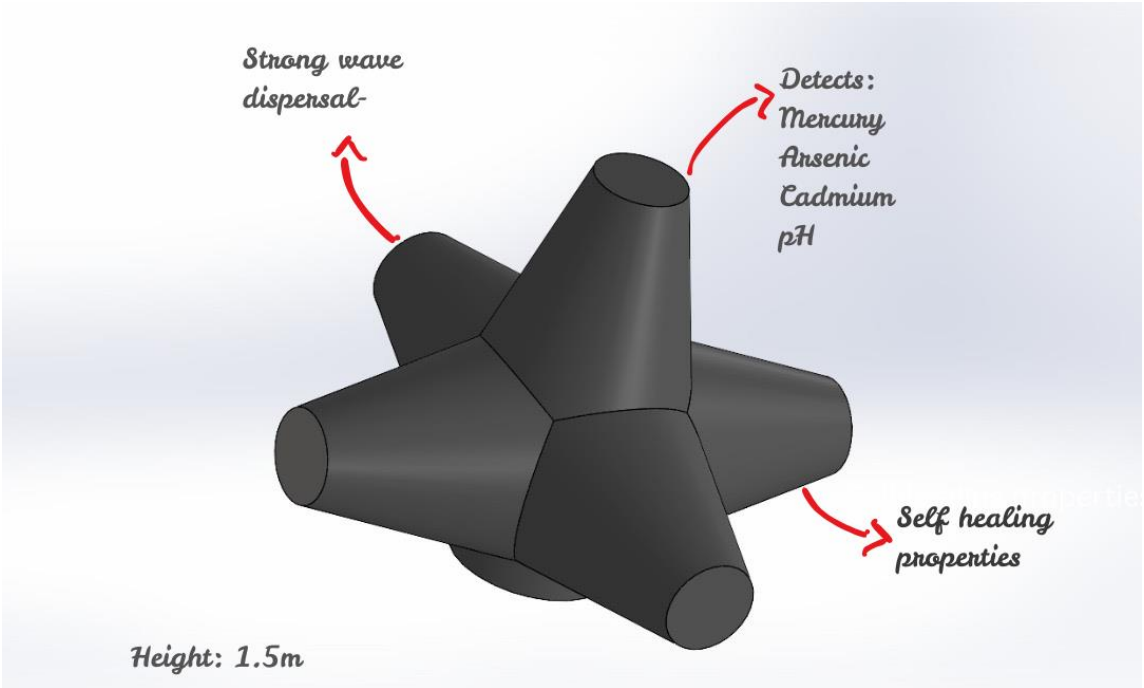


Figure 3: 3D model of our solution – The pentacone.

WHY THIS APPROACH?

The widespread use of cement based concrete tetrapods, sea walls and revetments to counter coastal erosion is increasingly becoming unsustainable. (Qu et al., 2021). Cement production generates substantial greenhouse gas emissions that intensify climate change. This urgent need for environmentally friendly, longer-lasting coastal defense systems has led us to develop Biokrete's biocement pentacone- a structure that not only offers superior durability but also reduces carbon emissions by replacing conventional cement with a sustainable alternative. Our processes are efficient and abide by regulatory requirements in synthetic biology hence being environmentally friendly.

DESIGN CYCLE

In solving our problem and developing our technology we implemented the design thinking approach as well as systems thinking. Systems thinking was instrumental in the early stages of problem identification. It helped us understand the scope of the problem and some intersecting problems that came with our coastal erosion. This set the foundation for us to employ design thinking to solve the problem of coastal erosion and high carbon emissions. Design thinking helped especially with reiterating our idea to ensure we have a solid concept and a practical product that is focused on our customers' needs.

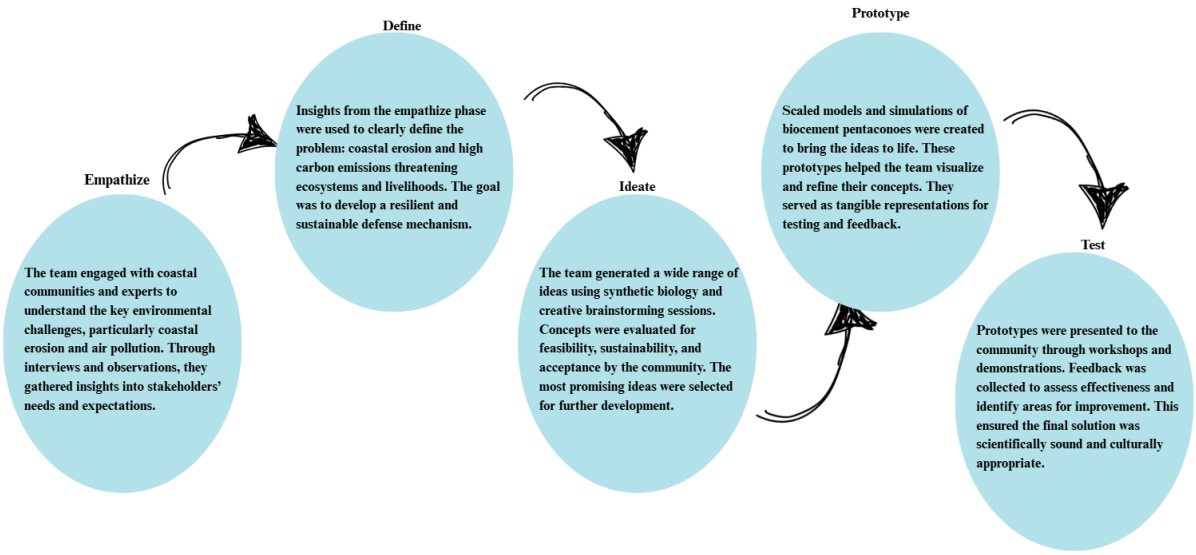


Figure 4: Design Thinking Cycle

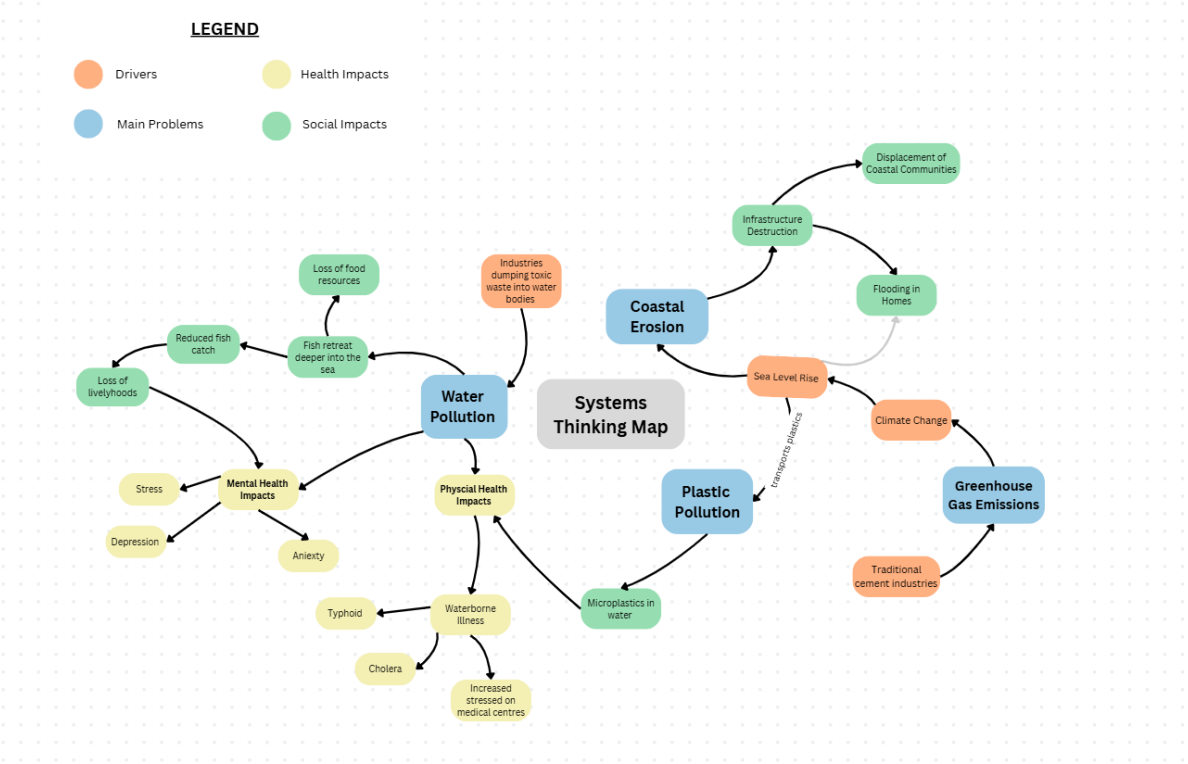


Figure 5: A map of the problem space

MINIMUM VIABLE PRODUCT

Previously, we had a proof of concept which was a set on scaled-down 3-D printed pentacones. Currently, we have an MVP, which is a scaled-down version of our pentacone. We performed mechanical tests on our MVP testing for flexural strength, compressive strength and tensile strength. The results showed promise as a viable and feasible solution.

Figure 6: An image of our first MVP.

FEASIBILITY OF OUR SOLUTION

We assessed the feasibility of our technology using the Technological Readiness Level assessment. This framework helped us analyze where we are in the product development phase. In conducting this, we investigated how we would develop our idea up to full-scale deployment and came up with key objectives for each technological readiness level and the corresponding actions for advancement. From those key objectives we set,we have successfully reached TRL 4 (Technology Development) as most of the lab work and proof of concept is done, and our minimum viable product (MVP). This makes our technology feasible.

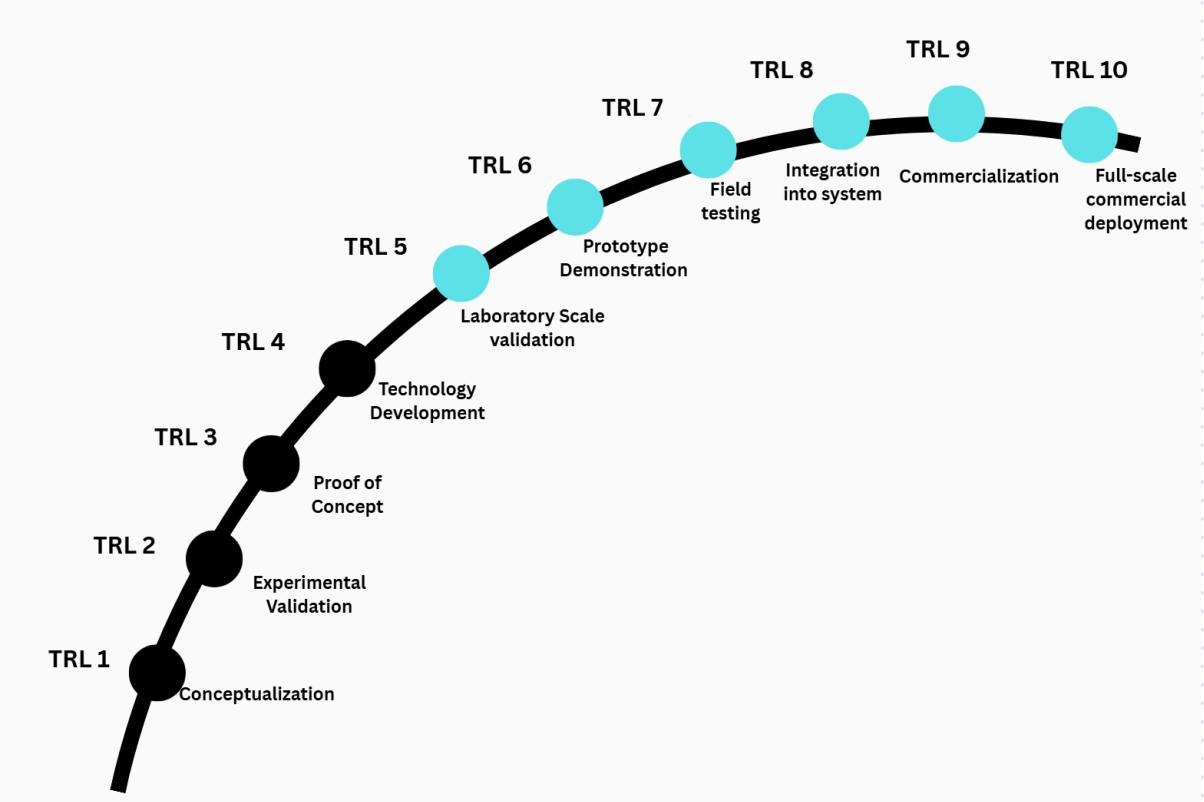


Figure 7: Technology Readiness Assessment ***(black: completed, blue: incomplete)***

MARKET SIZE ANALYSIS

To assess the feasibility of turning our innovation into a business venture, we conducted a market analysis for sea defense structures and biocement technology to project the potential demand for our product and by-products. Since we are entering the market for sea defense structures, we identified the total length of coastlines globally, which was 673754kilometers. We determined the average cost per meter (or kilometre) to place sea walls, and the average was $375 per linear foot. Our Total Addressable Market (TAM) was $828 billion, our Serviceable Addressable Market (SAM) was $35 billion, and our Serviceable Obtainable Market (SOM) was $676 million.

Since we are also entering into the green cement industry, the estimated TAM is valued at $39.32 billion. This TAM represents the value of the global green cement industry as of 2024. Our estimated SAM is $537.01 Million. This represents the current green cement market in Africa. We then calculated our SOM, the available Ghanaian green cement industry. This market is predicted to occupy 20% of the current traditional cement market. (GhanaWeb, n.d.).That then evaluates our SOM to $98 Million. (0.2*490) There are emerging opportunities in this market as it its estimated compound annual growth rate (CAGR) is 10.57%

fuelled by increasing environmental awareness and stringent regulations. The diagram below shows the market size for the green cement market:

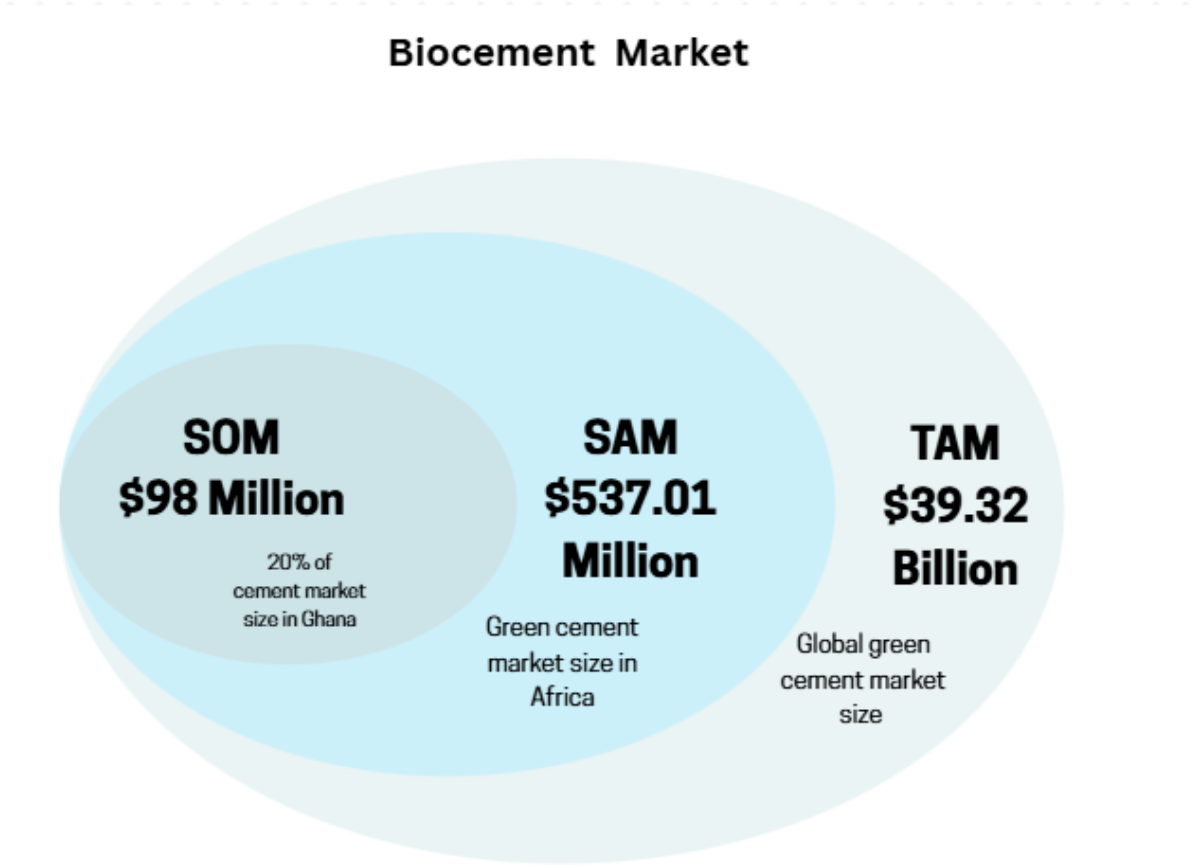


Figure 8: Market size analysis for the green cement industry.

Another approach to the Market Analysis for the Sea Defence Market:

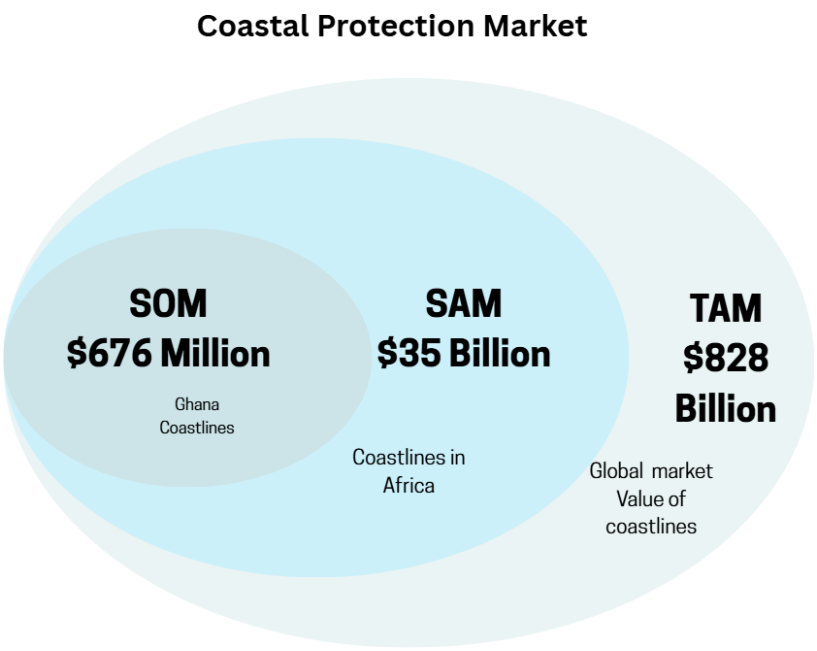


Figure 9: Market size analysis for the coastal protection industry.

Total Addressable Market= $828 billion

Serviceable Addressable Market= $35 billion (Coastlines in Africa)

Serviceable Obtainable Market= $676 million (Ghana Coastline 550km)

VALUE PROPOSITION CANVAS

In testing our product-market fit, we focused on the customer and value proposition sections of our Business Model Canvas. The purpose of the value proposition canvas was to test our assumptions about our assumed value proposition with a focus on our customers' pains, their expected gains and the job that they require our product to do for them. The value proposition canvas allowed us to increase our odds of creating a product that our customers will be willing

to acquire.

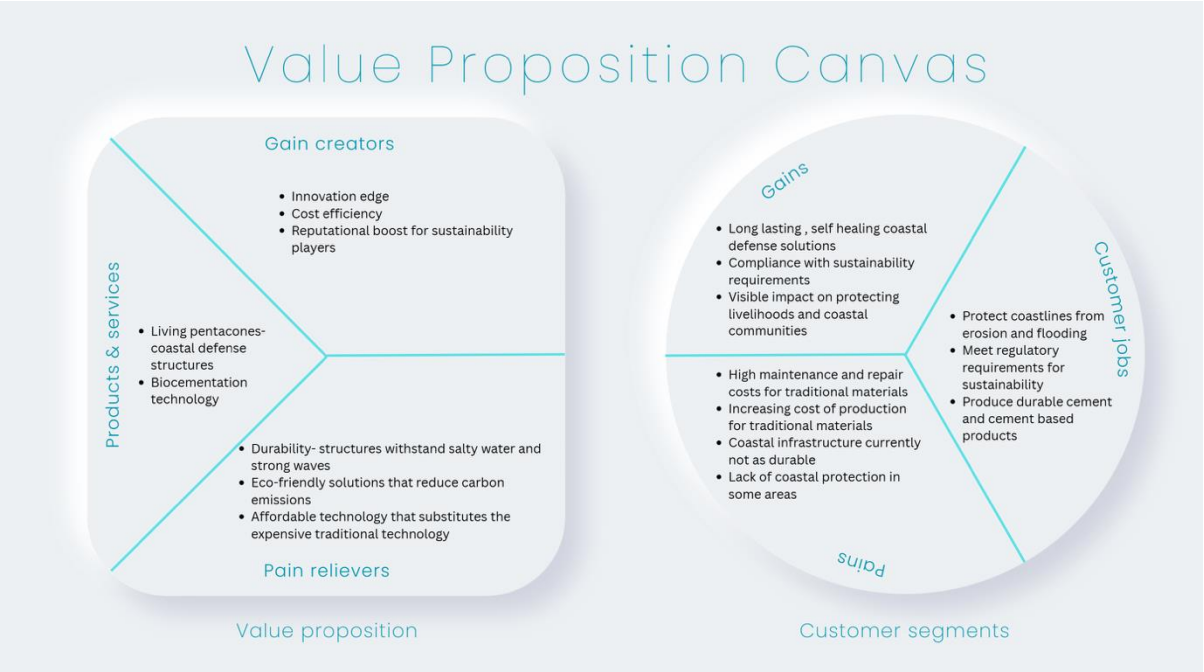


Figure 10: Value Proposition Canvas

STAKEHOLDER ANALYSIS

We carried out our stakeholder analysis, which is vital for our business as it helps us understand the interests, expectations, and influence of various stakeholders involved in our business. Below is a table of some identified stakeholders for this business:

Stakeholder	Influence	Description
Government agencies	High power High interest	**Ministry of Environment,** **Science, Technology and** **Innovation (MESTI):** Responsible for environmental policy

		formulation and regulation. **Environmental Protection** **Agency (EPA):** Regulates environmental protection and pollution control measures.
Construction industry players	High interest High power	**Jospong Group of** **Companies:** A diversified conglomerate with interests in construction, waste management, and infrastructure development. **LMI Holdings:** Engaged in civil engineering, construction, and real estate development projects across

		Ghana. **Construction Pioneers** **(CP):** Specializes in coastal engineering, dredging, and marine construction works. Ghacem: One of the biggest cement producers in Ghana.
Research institutions	High interest Low power	University of Ghana and other institutions working on related issues.
Investors	High interest High power	These are potential investors who may be interested in financing the different parts of our venture.
Suppliers – operational stake holder	High power Low interest	Suppliers of our raw materials
Standardization bodies	High interest	The Ghana Standards Authority (GSA) is the

	High power	national body responsible for standardization, metrology, and conformity assessment in Ghana. It was established to manage the nation's quality infrastructure, ensuring products and services meet quality standards for both local consumption and export.
Coastal communities	High interest Low power	**Tema Community:** A coastal city with a significant population affected by erosion and plastic pollution along its coastline. **Ada Foah Community:** Located along the Volta River estuary, facing challenges related to coastal erosion and environmental degradation.

		Elmina Community: Home to one of Ghana's oldest fishing communities, facing threats from coastal erosion and marine pollution.
General public	Low power Low interest	These are people not directly affected by the afore-mentioned problem and solution.
Industrial associations and trade groups	Low interest High power	**Ghana Institution of Engineers (GhIE):** Represents engineers across various disciplines, including civil, environmental, and chemical engineering. **Association of Ghana Industries (AGI):**

		Represents businesses across different sectors, including construction, manufacturing, and waste management. **Ghana Green Building Council (GHGBC):** Promotes sustainable building practices and green infrastructure development.

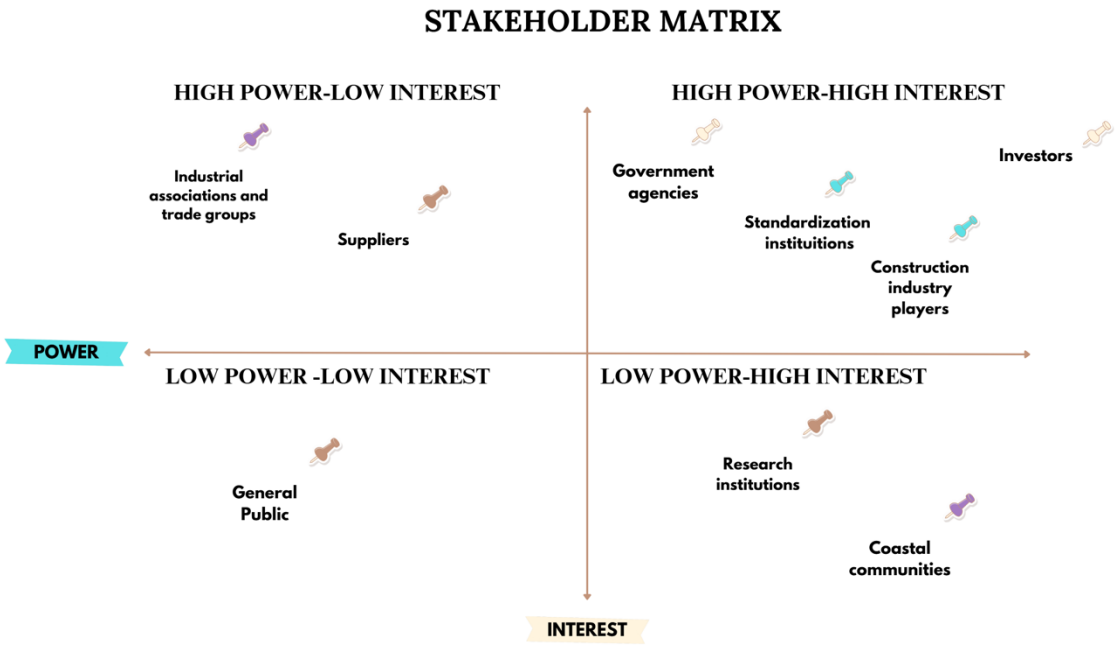


Figure 11: Stakeholder mapping for our identified stakeholders

STAKEHOLDER ENGAGEMENT

ENGAGEMENT

We visited Anomabo, a coastal community in the Central Region, where we interacted directly with community members who were affected by coastal erosion. We particularly engaged with an elder of the community who said he had lived close to the ocean for nearly half of his life but now the community had to shift back because of coastal erosion. Sometimes if the tides are too high the families living closer to the coast must move to high ground to prevent any deaths of the community members.

Some fishermen from the community were also engaged, they shared the same sentiments as the elder. Aside from the impact on their settlements, they mentioned that because of how the land is now, some of their kids get taken by the waves during high tides, when care is not taken.

After gaining an understanding of the pain points of the people directly faced with the challenges, we met experts of the coastal management unit at the University of Cape Coast. They commended our biocement technology for construction materials for the coastal communities as it is cost-efficient in production and eco-friendly as well this opened up our market opportunities because we did not only need to focus on preventing coastal erosion but could develop a solution that benefitted the local and urban populace. On the biosensing properties of our sea defense structure (the pentacone), they agreed to the need for cheaper means of detection, as well as the issue of heavy metal pollution in the oceans off late which helped us confirm the desirability of our product among our customers.

Figure 12a: Visit to Anomabo and interview with affected stakeholders.

Figure 12b: Visit to the centre for coastal management for interviews and insights into the problem space.

MARKET ANALYSIS

Customer segments

Biokrete's innovative biocement technology has multiple potential applications especially within the sea defense solutions. To ensure successful adoption we identified and analysed key customer segments where our products will gain the most traction. Our primary customers include governments agencies and municipalities responsible for coastal protection, who face fiscal and social costs from erosion. They also include cement making companies that aim to be more sustainable in production. Secondary customers include construction firms and engineering contractors engaged in sea defense projects who seek durable and cost-efficient alternatives to traditional tetrapods. In the longer term, international development organizations and NGOs focused on climate adaptation represent

additional partners and clients. This segmentation guides our marketing and sales strategies by allowing us to tailor engagement approaches to each group.

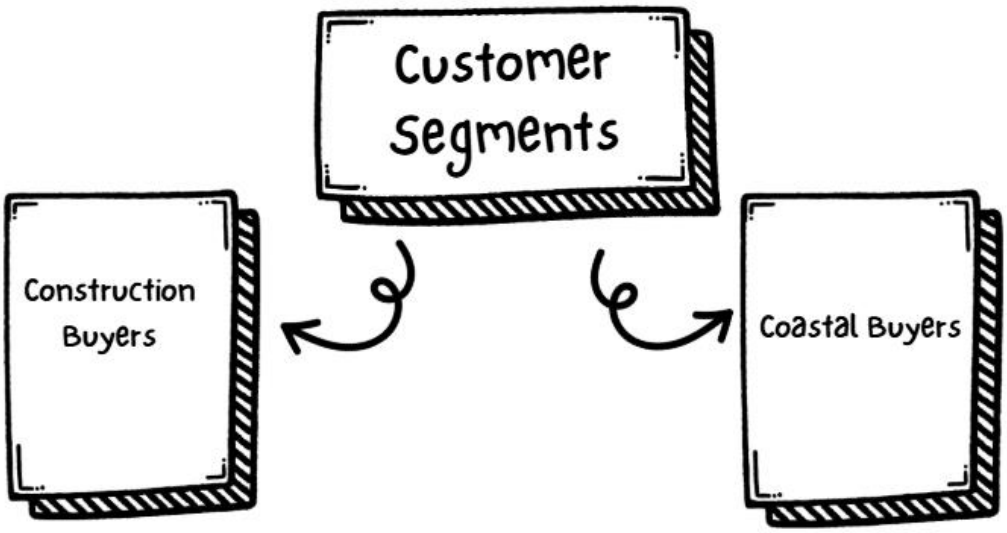


Figure 13: Customer Segmentation

Potential Customer Segment	**Explanation**
Construction buyers	Construction firms, Cement producers
Coastal buyers	Coastal management companies, environmental organizations, governments

Our Top Potential Customers

1. **Bess Blocks**

Bessblock Concrete Products Ltd is a leading Concrete Block Manufacturing in Ghana that focuses on new product formulations and produces the best quality blocks. They are interested

in adopting new technologies that can both cut down production costs while still providing the best quality of products to help them retain their customers.

2. **Green Block Ghana**

A company that produces light weight concrete also known as cellular concrete. They also supply lightweight concrete products such as blocks and lintels. Most of their offerings are still in the R &D stage, which means that they may be willing to acquire our patent since we are venturing in most of the work regarding producing eco-friendly cement.

3. **African Concrete Product**

ACP's goal is to actively reduce the carbon footprint related to concrete production. To achieve this, they are dedicated to adopting alternative materials that have lower embodied carbon. Furthermore, they are committed to optimizing their production methods to significantly decrease energy consumption. By adopting new technologies and refining operational techniques, they are striving to streamline their processes and minimize the environmental impact. Their efforts align with our commitment to sustainable practices and to reducing our ecological footprint. ACP's goal presents an opportunity for us to provide them with our services, particularly our patented biocementation technology.

4. **Environmental Protection Agency**

This organization is the lead public body under the Ministry of Environment, Science, Technology and Innovation (MESTI) responsible for protecting and improving the nation's environment and resources through policy implementation, planning, and regulatory enforcement

Top Customers

Figure 14: Identified top customers for our business

Potential Partnerships to explore:

BioKrete is entering complex markets such as the cement market, that may be very difficult to penetrate due to large duopolistic players that already hold a large chunk of the market share, we are considering maximising on partnerships. These partnerships will help us reach our target markets as our potential partners already serve them and they will also help us expand the reach of our long-term impacts.

Mawums

Amandi

Green construct ALS

1. **Mawums** -A Ghanaian coastal protection company that does consulting for sea defense and civil engineering and crafts tailor-made solutions through their engineering team.
2. **Amandi**- They work on large scale government projects for marine engineering, building ports and defenses. They provide sea defense infrastructure such as breakwater, revetments, and groynes along the Ghanaian coastline. If approached early, they could be a strong intermediary customer to include our pentacones to their line of production.
3. **Green construct ALS**- A company focused on more sustainable alternatives to Portland cement. They focus on upcycling alum sludge into a binding material for construction with comparable features to Portland cement, reducing clinker imports and carbon emissions. They produce sandcrete blocks and tile binders for tile work. They also aim to provide quick credible testing and customized improved recipe services.

Competitive Intelligence

Porter five forces model

To identify and analyse the competitive forces within the industry that we are entering, a Porter's Five forces model was conducted. This model is for guiding Biokrete on competition and profitability within the industry and where the power typically lies.

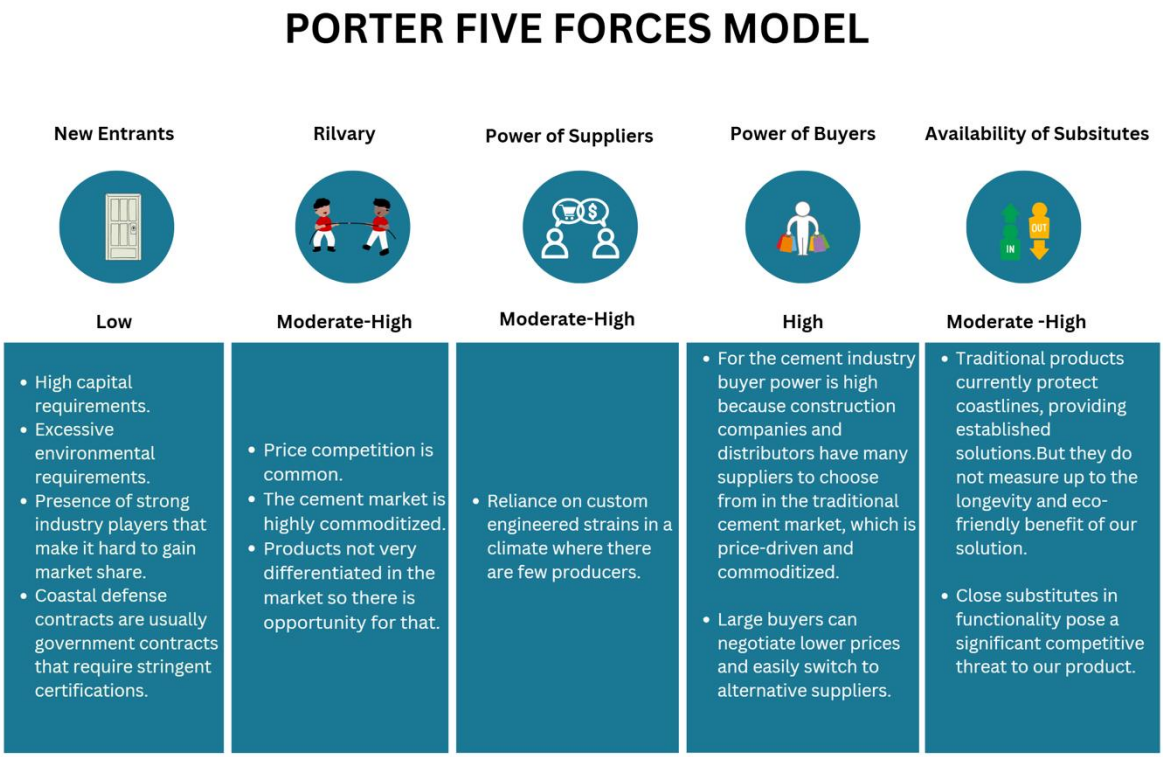


Figure 15: Porter's five forces model

Competitor Analysis

For the Coastal protection market, we realized that there is an overlap between the potential intermediary customers and the competitors. Intermediary customers are those actors that might not want to buy the pentanones directly but may want to include our processes in their project designs**.** Our target is to be able to engage our competitors early enough to translate them into intermediary customers so that our technology can be far reaching.

Comparison chart

Comparison chart-Biocement

Feature	BioKrete	Yehans	Dredge masters
Biotech or advanced materials	✓	✗	✗
Sustainability focus	✓	✗	✓
Self repairing technology	✓	✗	✗
Custom design and engineering	✓	✓	✓
Patentable IP	✓	✗	✗
Durability of structures	✓	✓	✓

Figure 16: Competitor comparison chart for the biocement industry

Comparison chart- Coastal protection

Feature	BioKrete	Green block	Biomason	Ghacem
Focus on carbon emission reduction	✓	✓	✓	✓
Uses bacteria in production	✓	✗	✓	✗
Reduces clinker usage	✓	✓	✓	Unknown
Customized solutions	✓	✗	✓	✗
Durable concrete and concrete based products	✓	✓	✓	✓

Figure 17: Competitor comparison chart for the coastal protection industry

SWOT Analysis

Our SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) is a framework to help assess and understand the internal and external forces that may create opportunities or risks for the Biokrete and its products. We intend to capitalize on the strengths and opportunities and to minimize risks and improve on the weaknesses.

Figure 18: SWOT analysis for the pentacone as a business

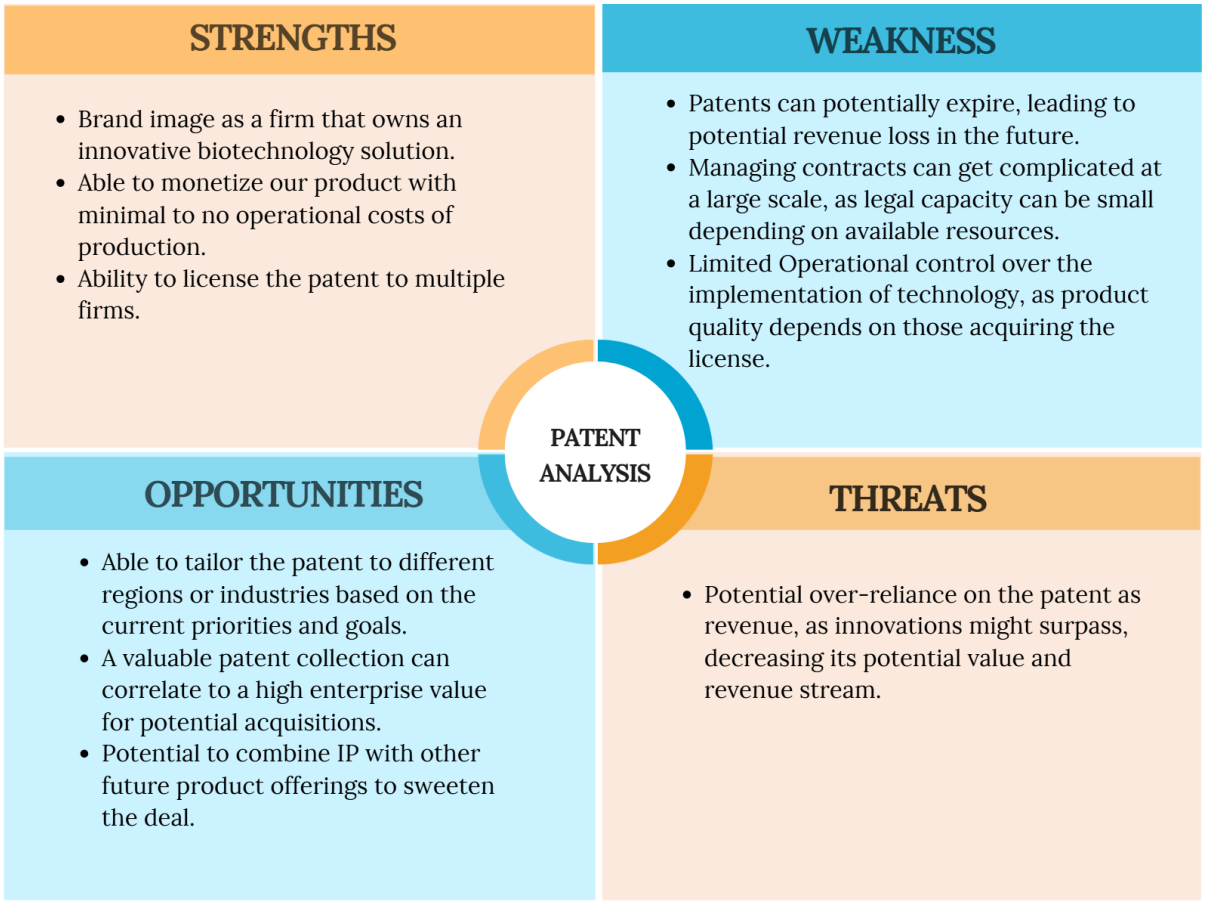


Figure 19: SWOT analysis for the patent as a business

PESTEL Analysis

Our PESTEL (Political, Economic, Social, Technological, Environmental, and Legal) analysis helped us identify opportunities and threats in the external environment. We were also able to identify potential risks, opportunities, and emerging trends related to ethics, demographics, and other factors that could impact technology development and market adoption and develop strategies to leverage the opportunities and mitigate the threats.

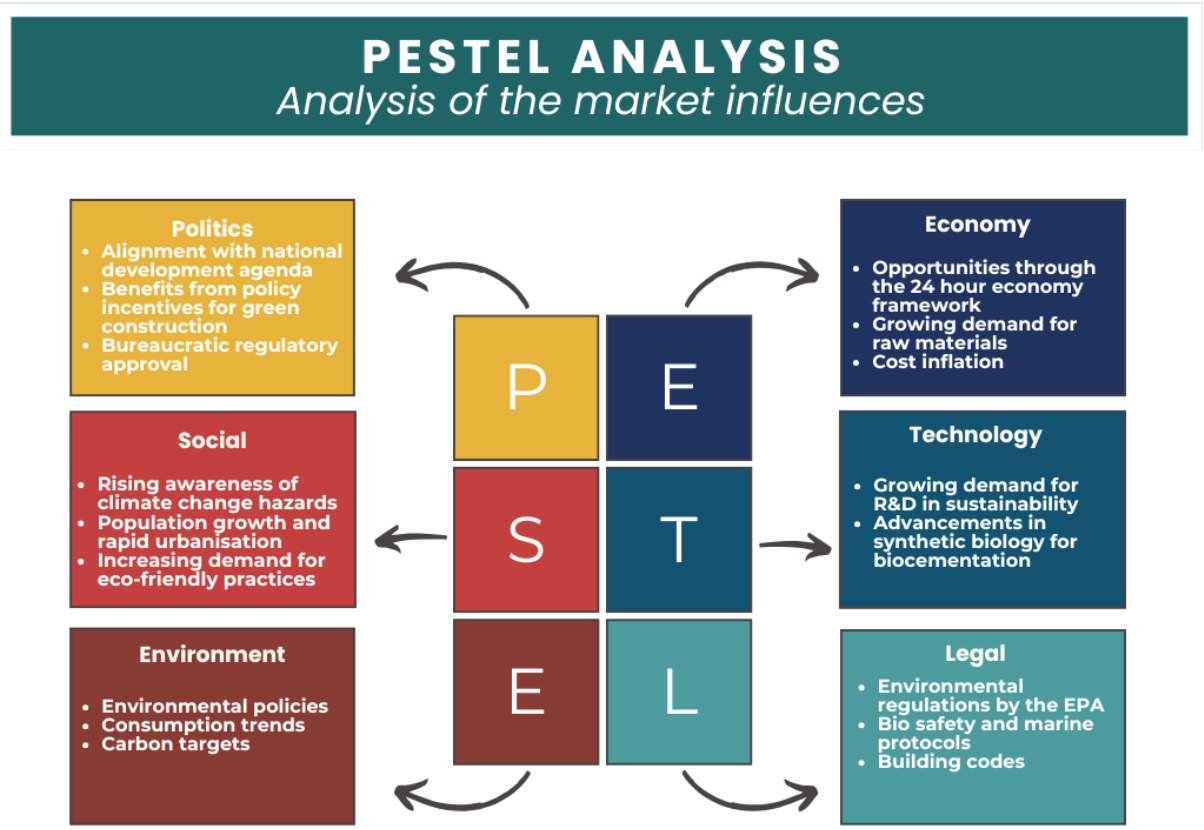


Figure 20: PESTEL analysis of our business.

COMMERCIALIZATION

Positioning Statement

For construction firms, cement manufacturing companies, and coastal communities in Ghana, BioKrete is the only company that offers an alternative method of cement production and large-scale sea defense, which is both environmentally sustainable, indestructible, thanks to our self-repairing bio-brick developed using advanced synthetic biology technology and capable of sensing the presence of select heavy metals(Cadmium, Arsenic and Mercury) and pH of the oceans.

Positioning Map

We created a positioning map to articulate how we want our brand to be viewed in the market against competitors. We want to enter the market and be known for our exceptional ability to use advanced biotechnology in the creation of highly sustainable sea defense and cement solutions.

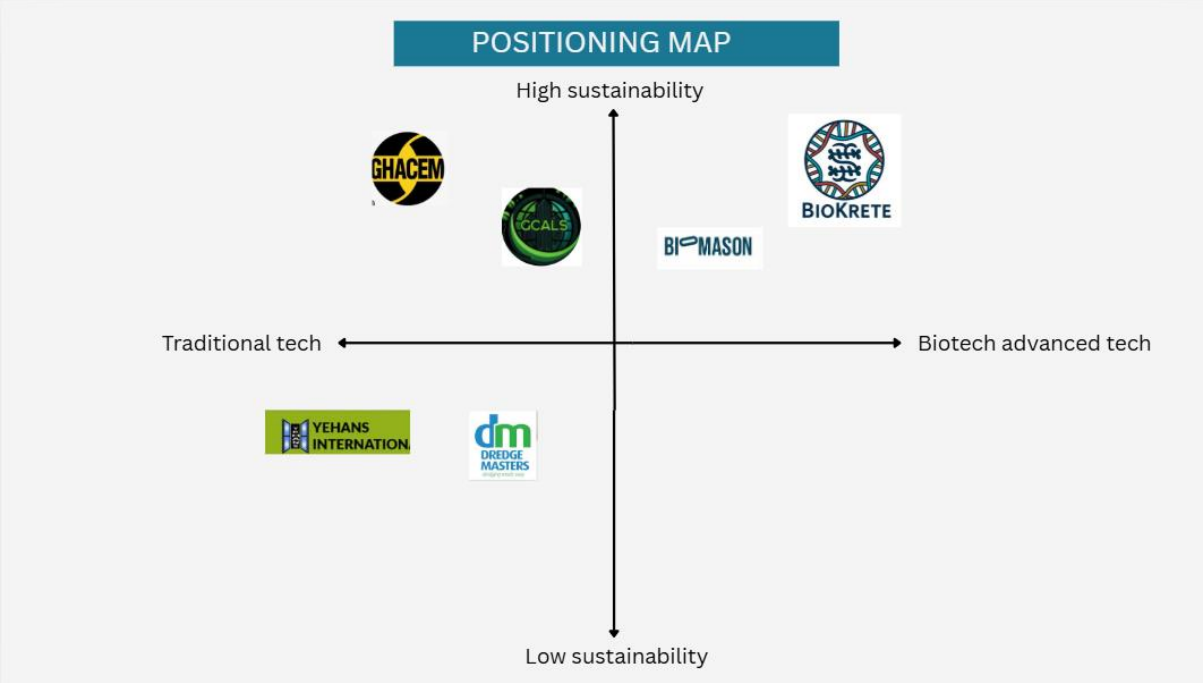


Figure 21: Positioning map for Biokrete as we are new entrants

BUSINESS MODEL CANVAS

To cater for the different components of our business, we created a business model canvas. This showed us different components of our business and most importantly brought out our value proposition that will be effectively used to form our unique selling point. The business model canvas highlights the use of strategic partnerships with construction firms to produce our self-repairing, and biosensing pentacone. It also focuses on the licensing model which seeks to give major construction firms and cement manufacturing companies access to our patent which gives them non-exclusive rights to produce our innovative biocement.

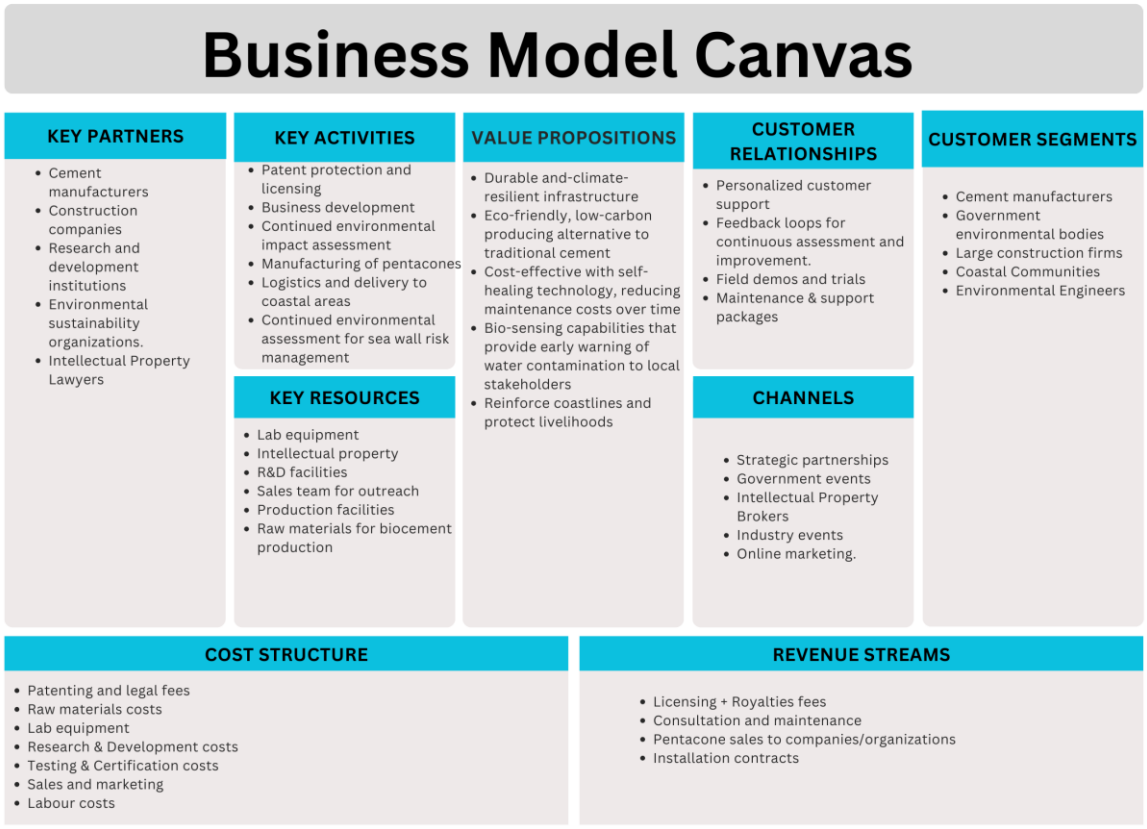


Figure 22: Business model canvas (BMC)

Business model and revenue strategy

BioKrete plans to run a licensing model for the biocementation process where there will be structured stage payments as our customers would pay as they grow.

Our goal is to have sustainable revenue streams.

1. **Licensing the patent**

Structured stage payments (Pay as you grow):

Stage 1: Pay small initial fee upon signing the agreement (30%) which according to research can be between $5000 - $50000

Stage 2: Pilot/ testing phase. Pay after successful testing and validation of technology at the plant (40%)

Stage 3: Commercial production- final balance is paid. Scaling up and selling.

At stage 3 licensees start paying royalties which according to research can be upto 5.6% of net sales

Requirement: Minimum annual Royalty paid regardless of production delays as time moves on- to ensure firms do not just sit on the technology.

Target: companies that produce concrete based products such as blocks, lintels, air vents, etc

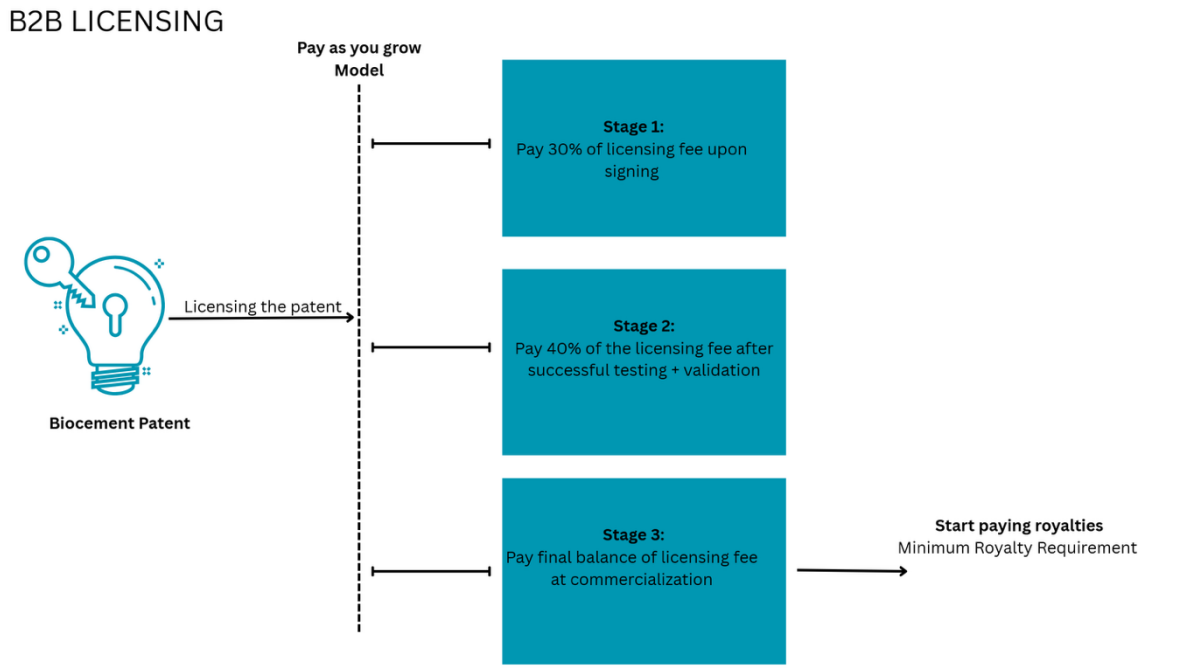


Figure 23: Revenue strategy: B2B licensing model structure

2. **Pentacones**

B2B sales via Construction firms/ firms that are already into coastal production.

Partnerships with firms already into sea wall construction and see if we can add our processes to theirs as co-contractors.

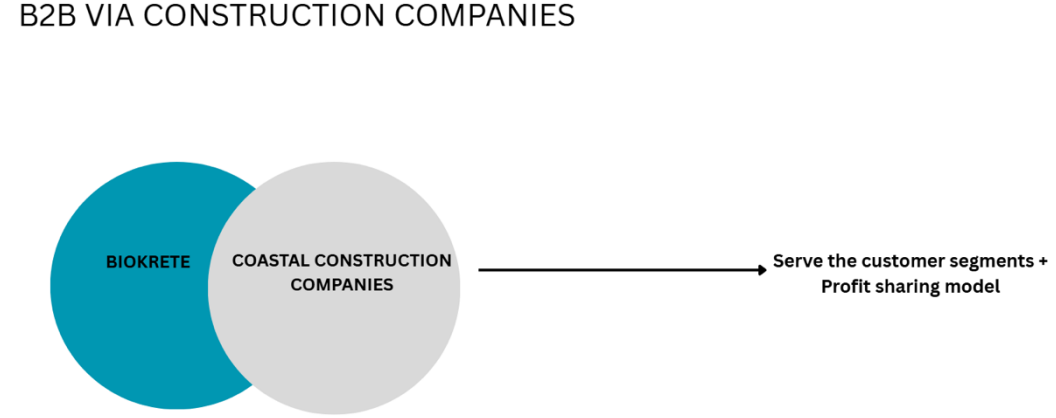


Figure 24: Revenue strategy: B2B via construction companies structure

GO-TO-MARKETING STRATEGY

To enable us to have a successful product and technology launch, we mapped out a step-by-step plan to help us enter the market and drive demand. Since we have identified our target market as construction companies, cement manufacturing companies, environmental organizations, and governments, we developed strategies that align with who our customers are. One of these strategies includes a B2B approach as our transactions will be directly between our business and other entities, also involving long sales cycles. Our licensing model also gives our customers non-exclusive rights to use technology as well as leverage the opportunity to connect directly with their eco-conscious customers.

Our customers will go through stages, gaining **Awareness** of our product, developing **interest** in it, experiencing a **desire** for it, and ultimately acting towards **obtaining i**t. This is through the AIDA model of which is illustrated on our sales funnel. This is how we plan for our product to reach our customers in the market, considering our product, the price, distribution outlets, and promotion:

Figure 25: Sales funnel using the AIDA framework.

Value Chain Analysis

Our value chain analysis is a strategic tool used to understand and analyze the entire process involved in developing, producing, and delivering our technology. This includes each step from research and development to production, distribution, and customer support. Through this we can identify activities that add value to our final product. It allows our business to focus on enhancing these activities to improve efficiency and competitiveness.

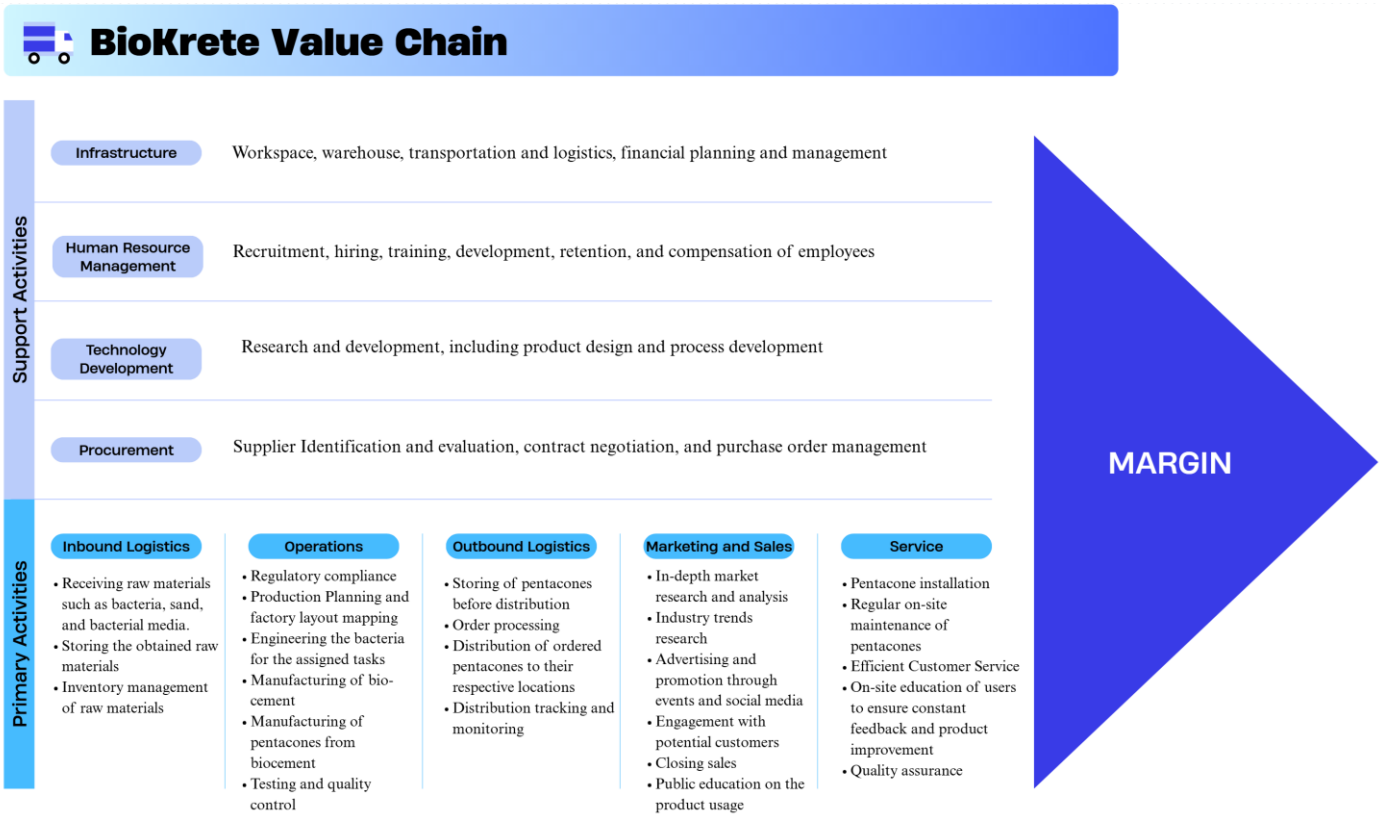


Figure 26: Value chain analysis

Risk analysis and Mitigation

Guided by the fact that the nature of the product we are producing is prone to many risks, we took time to identify some of the potential risks and came up with contingency plans to mitigate them. The risks we came up with were divided into the following categories:

1. Technical risks – the potential for failures related to engineering or technical aspects of our product.

2. Market risks- risks related to failure to penetrate the market and movements in market variables such as exchange rates
3. Regulatory risks – these are risks related to laws or policies governing industries related to our product such as environmental management and the construction industry.
4. Operational risks- risks related to in-house system failures
5. Reputational risks- risks related to the public perception of the business
6. Intellectual property risks: because we are engineering bacteria to come up with our actual product and we may need to use other processes there is need to conduct a thorough IP risk assessment. There is need for us to be aware and to prevent ourselves from falling into the pitfalls of infringing upon existing patents or even having ours infringed upon

Risk Analysis Matrix

Risk	Example	Likelihood	Impact	Risk score	Risk level
Technical risks	Pentacones fail in salty conditions	2	4	8	Medium
Market risks	We fail to enter either market	1	5	5	Medium
Regulatory risks	There may be delays in environmental approvals	4	4	16	Extreme
Operational risks	Bacteria fail to scale, or lab supplies don't work	3	4	12	High
Reputational risks	Communities fail to trust bioengineered materials	4	4	16	Extreme
Intellectual property risks	Infringing upon existing patents	1	5	5	Medium

Risk mitigation strategies

Risk Response Matrix

		Inherent Risk(without controls)				
ID	Risk Description	probability	impact	Risk score	control(s)	Control owners
1	Technical risks	Low	High	Severe	Conduct robust testing before launching and make all improvements as needed	Lab team
2	Market risks	Very Low	Very High	Severe	Conduct thorough market analysis	Entrepreneurship team
3	Regulatory risks	High	High	Critical	Engage regulatory parties early maintaining proactive communication	Whole team
4	Operational risks	Medium	High	Severe	Identify secondary suppliers and run scaling tests in early phases	Whole team
5	Reputational risks	High	High	Critical	Consult with IP lawyers earlier within the process	Entrepreneurship team
6	Intellectual property risks	Very Low	Very High	Severe	Run awareness programs and partner with community leaders and market leaders	Entrepreneurship team

Impact:		Very Low	Low	Medium	High	Very High
Probability	Very High	Moderate	Severe	Severe	Critical	Critical
	High	Sustainable	Moderate	Severe	Critical	Critical
	Medium	Sustainable	Moderate	Moderate	Severe	Critical
	Low	Sustainable	Sustainable	Moderate	Severe	Critical
	Very Low	Sustainable	Sustainable	Sustainable	Moderate	Severe

Figure 27: Risk assessment matrix

Growth and Exit strategies

Growth Strategy

BioKrete desires long-term growth and for this reason we developed a growth strategy which includes market penetration strategies that informs how we plan to successfully enter new markets and existing ones. One of such strategies is to make our brand name recognizable in the market using a combination of above-the-line and below-the -line marketing strategies included but not limited to newspaper, industry journal advertising, stakeholder workshops and trade fairs.

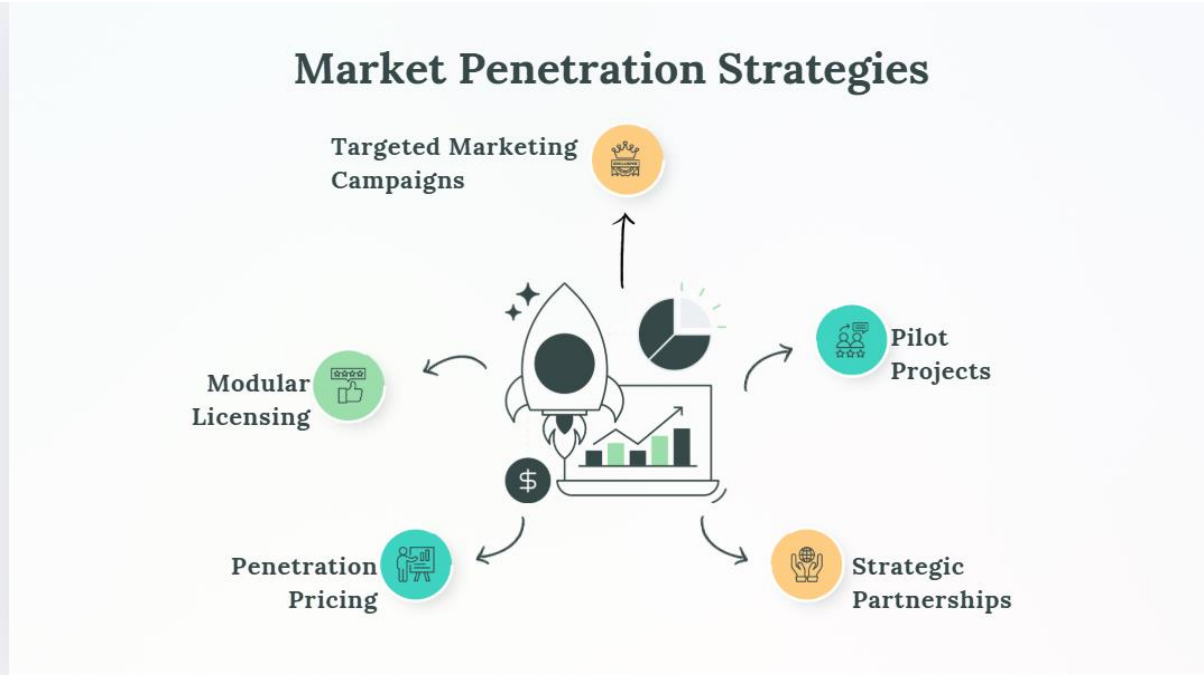


Figure 28: Market penetration strategies for BioKrete

Considering diversification in our business as a growth strategy can allow our business to tap into new and diverse markets. It broadens the customer base, providing opportunities for growth and revenue generation beyond the primary target market for biocement and coastal protection. As a team, we can leverage its existing expertise, knowledge, and competencies in bacteria-based technologies to diversify into related areas. This ensures efficient utilisation of core strengths for our expansion. Some of the diversification strategies we can consider include:

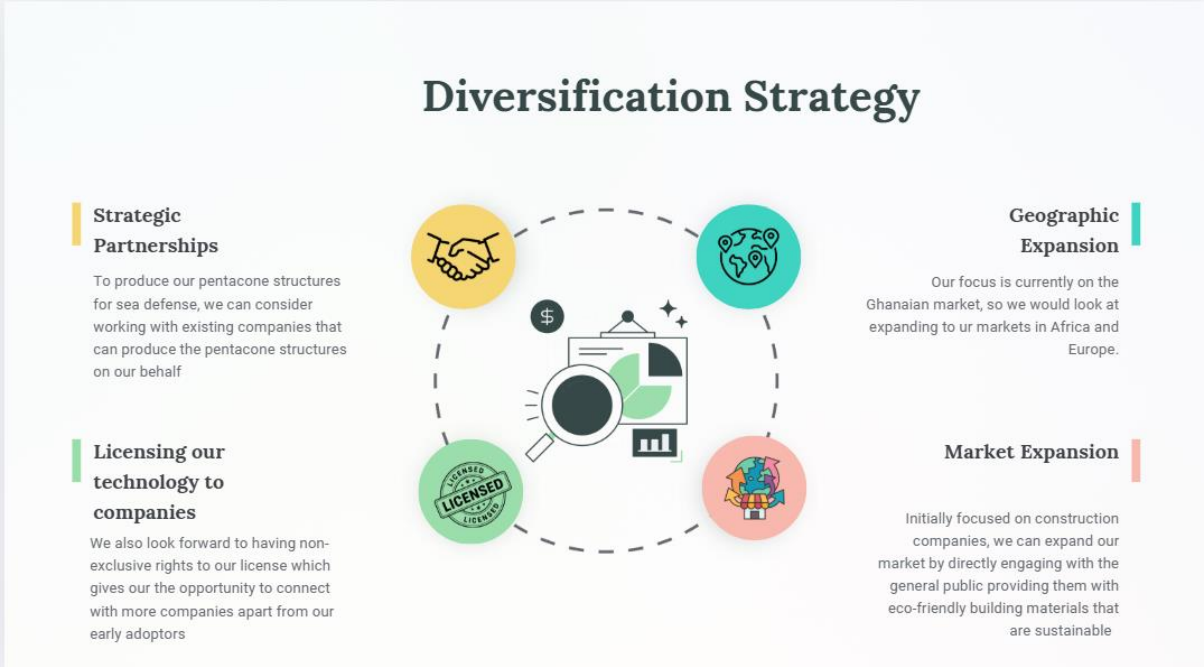


Figure 29: Diversification strategy for BioKrete

We then developed a business exit strategy which presents another strategic plan for the future of BioKrete. If in the future, we want to sell off BioKrete or a share of it to other investors we will pursue the exit strategy.

Exit Strategy

In the long term, our business exit strategy will involve a strategic acquisition by a larger company. A strategic acquisition would offer the most aligned and high impact exit for our startup.

Some of our potential acquirers include construction material companies, synthetic biology firms looking to expand their portfolios, and ESG-conscious manufacturers seeking to meet decarbonization targets.

The main reasons why these companies may choose to acquire us is due to:

- Our proven proprietary technology
- Potential acquirers already serving our target markets
- Larger firms may not have in-house bioengineering capabilities but still want to innovate.

Long term impacts

Biokrete aims not to be just another synthetic biology start-up, but a sustainable business that also prioritizes long term impacts. We looked at our long-term effects, and they are explained below:

	Finding potential ways to eliminate harmful pollutants (by detecting heavy metal pollutants) from the environment by reporting the presence of these pollutants in the ocean through our sea defense structures using engineered bacteria.
	• Team Pentavib introduces a biological alternative to traditional cement, disrupting an industry responsible for 8% of global CO_2 emissions. • Promotes local, small-scale manufacturing of sustainable construction materials using open-source biotech principles, reducing dependency on imported cement. • The use of sustainable building materials and community-based deployment also contributes to affordable housing and climate-resilient construction practices.

	• Cement is one of the most carbon-intensive materials. Our biocement provides a low-emission, microbial-based alternative, reducing Green House Gases emissions over its lifecycle.
	• One of BioKrete's goals is to protect coastal areas as well as report the presence of harmful toxins in the ocean that will not harm life below water ensuring that there is always a balanced ecosystem.

We also looked at the triple bottom line (people, planet, and profit) to see the effect of our technology on all these important stakeholders.

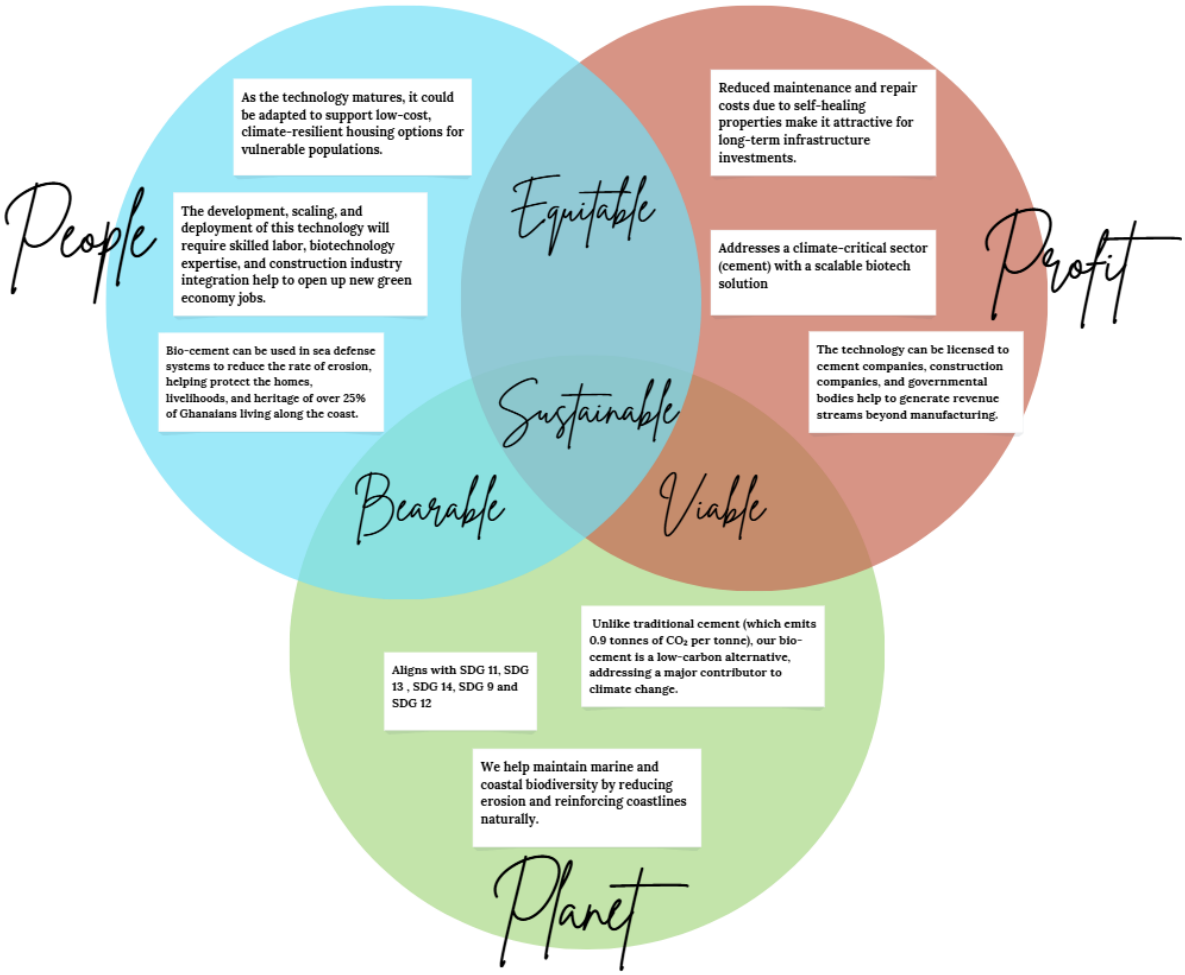


Figure 30: Triple Bottom Line

Biokrete is also considering the long-term impacts that the use of bacteria that will be exposed to the ocean. While these bacteria play a crucial role in creating our biocement, it is vital that we ensure they do not negatively affect marine ecosystems. These environmental risks will be mitigated through continuous collaboration with experts to assess and monitor any potential ecological impacts. We have worked on a policy draft that focuses on the bioethics surrounding the use of bacteria. Additionally, we will implement robust safety guidelines ensuring that the bacteria remain contained and function only within restricted parameters. We have made use of some biocontainment strategies such as hydrogel casing, kill switch, pentacone casing, etc.

FUTURE PROSPECTS

Company roadmap

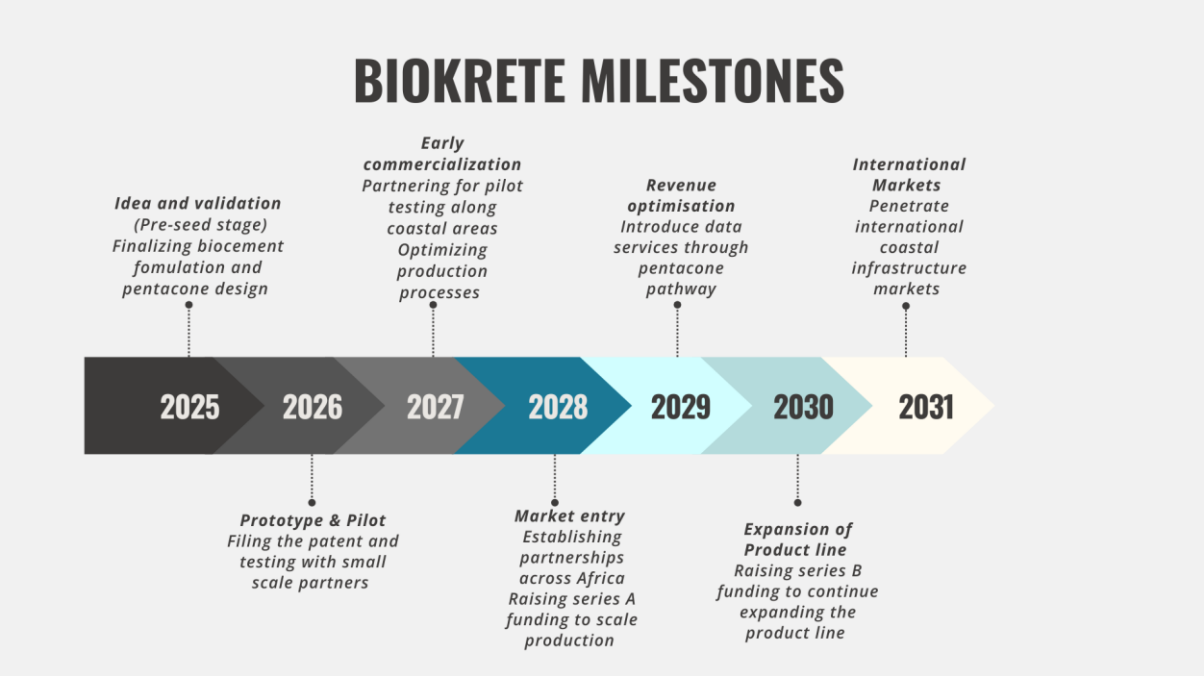


Figure 31: Company Roadmap

We developed a 7-year company roadmap to get a sense of our long-term vision. The company roadmap shows the detailed timelines and the stages of the development and growth of our startup.

Project development timeline

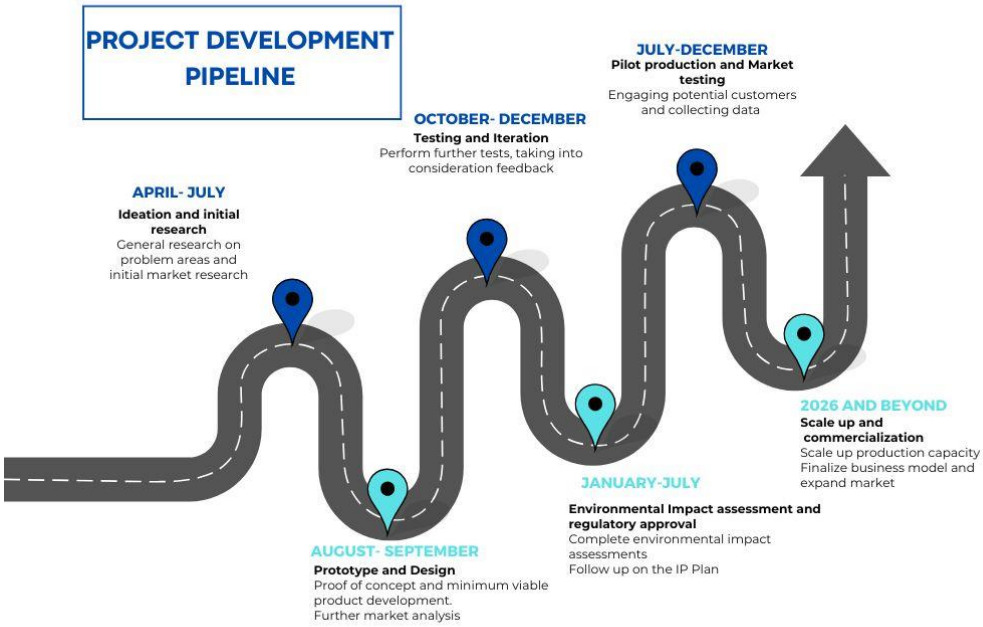


Figure 32: Project development pipeline

Gannt Chart

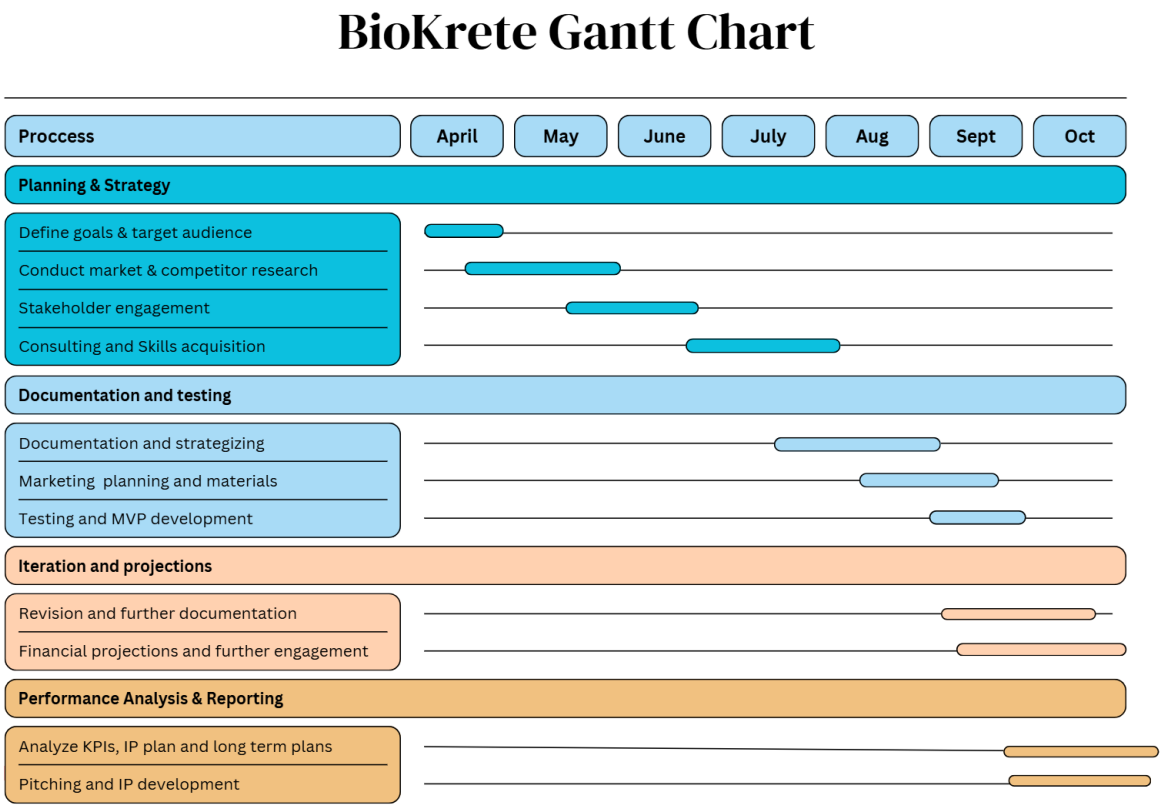


Figure 33: Gantt Chart

Intellectual property

IP strategy

Our business model for engaging with potential customers is a licensing model, which relies solely on the fact that our technology, which is the intellectual property, has been duly protected. We have explored some strategies surrounding IP protection, which include trade secrets, trademarks, and patents. We initially considered trade secrets since it was the easiest way to protect valuable company information without jeopardizing our chances of filing for a patent when the idea was fully fledged. But upon further communication with our principal investigator and advisors, we were encouraged to pursue filing a patent from the get-go. This will allow us fully to develop our idea and present a strong business case for our licensing model. The trademark IP protection was for our logo which we want to have rights over as we pursue partnerships to execute our second solution (the pentacones).

We then research the IP protection landscape in Ghana to determine how we would go about further pursuits of transferring our technology through the technology transfer office at Ashesi University.

Below is a breakdown of how the patenting process occurs in Ghana.

1. A Patent application is filed with the prescribed fees which must contain: a description, claims, abstract or drawings where applicable
2. The application is acknowledged with a filing date and application number
3. Power of attorney if applicable, where applicant is a foreigner or foreign entity based outside the jurisdiction
4. The formality examination is conducted by the Patent Registry to ensure that all the formal requirements in respect of fees and information required are provided.
5. A Search and Substantive examination is subsequently conducted for the invention claimed in the application/ request
6. The application is Refused where it does not meet the patentability requirement as provided by the Patent Act
7. The application is Granted where it meets the patentability requirement in accordance with the Patent Act
8. The application is Published in the Industrial and Commercial Bulletin
9. A certificate is issued for the patent
10. In order to maintain the patent or patent application, an annual fee shall be paid in advance to the Registrar for each year, starting one year after the filling date of the application.

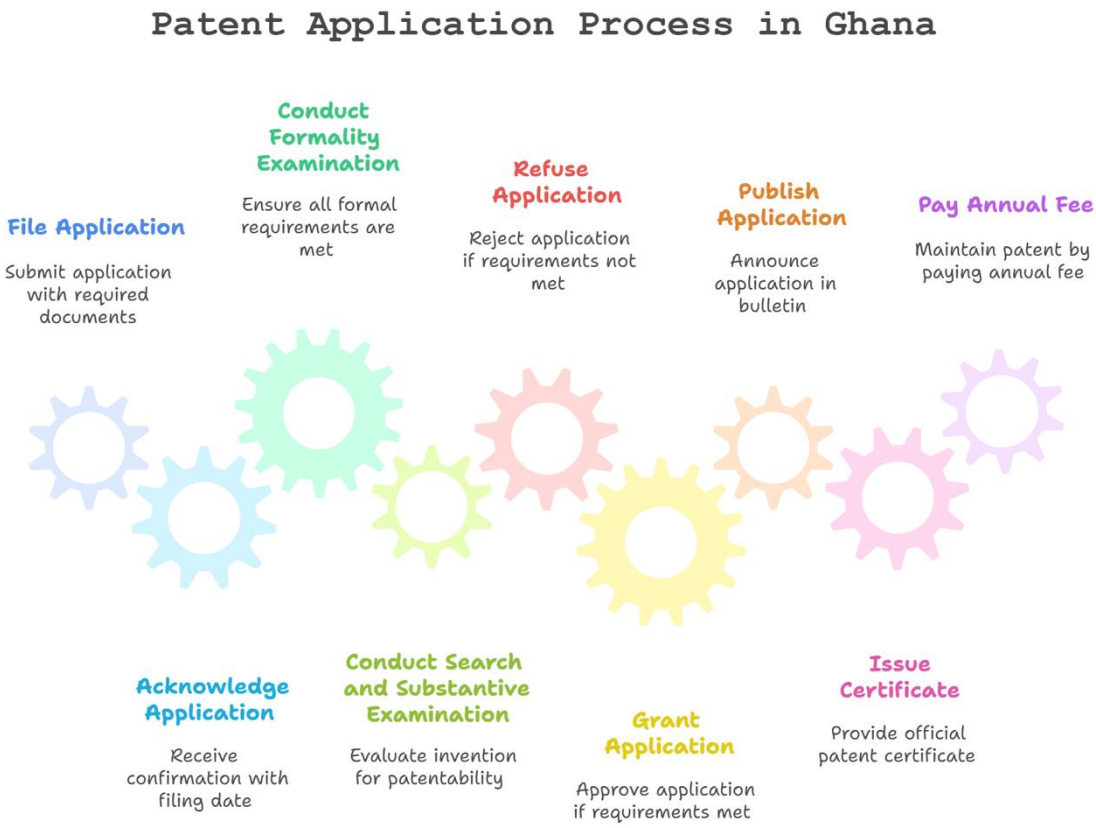


Figure 34: Patenting guidelines

Upon understanding how the process works in Ghana, we also looked into filing for a provisional patent for the time being as we advance in the levels of our technology readiness assessment. The provisional patent gives a 12-month grace period, which gives us even more time to fully advance our solution after iGEM, so we can make a strong case when we file our formal patent.

Regarding our current progress, we are currently gathering documents relating to the idea that we want to patent and in talks with members of the TTO at Ashesi University to ensure that all documents are ready and clear before we start the process. But before we started any of this, we ensured that our idea ticked the three key boxes for filing for a patent with Google Patents and the WIPO Patent and Trademark Database, which affect the production in both the cement manufacturing industry and construction firms. It was then confirmed that filing a patent was completely possible and achievable.

We are actively engaging with mentors and advisors to make this a reality, and they expressed the great possibility of us attaining a patent.

The communications with the Intellectual Property Monitoring Committee (IPMC) lay out the process for which our patented technology can be licensed to our customers. Having identified our stakeholders and engaged with them, we are optimistic that obtaining a license is highly achievable after significant work has been done in the research and development phase of our product development.

Below is a simplified breakdown of interactions

1. The Invention is made
2. A write-up called invention disclosure for the full invention is written down and it is often submitted to the university's TTO (Our team is currently at this stage of the process)
3. The school's TTO determines if the invention is patentable. Once that has been agreed upon, the office handles the filing process with the school's IP attorney. (Our team however will be exploring a US provisional patent since that gives us the 12-month grace period after the Igem grand Jamboree in Paris
4. After the patent has been successfully filed and received the technology transfer now begins.
5. Potential clients (licensee) are sought through a collective effort both by the team and the office)
6. Once these customers have been secured, license agreements are written out and signed by the inventor (s) to them so revenue can come in the form of a one-time payment or royalties.

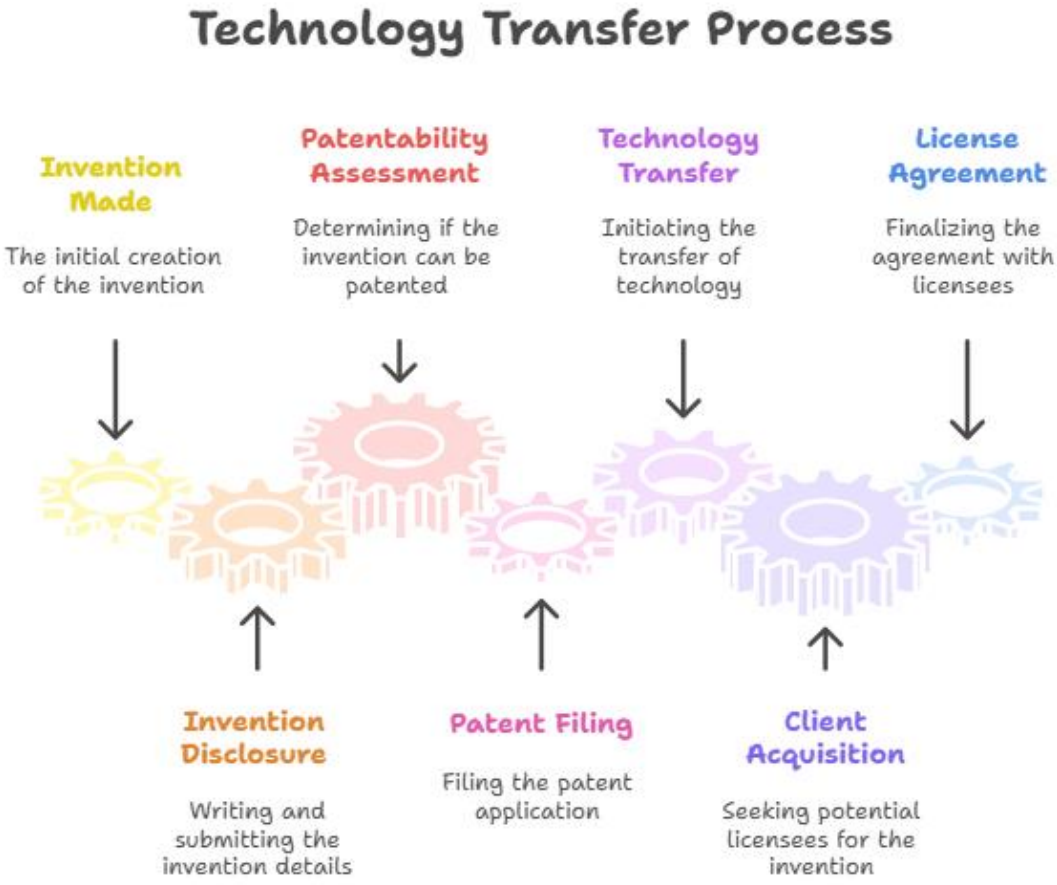


Figure 35: Technology Transfer Process

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