

B I O S P H E R E
S O L A R

Read Me Document

2022

1. Why we are here

Our earth is a closed system floating around in a massive universe. It is a small oasis in an otherwise currently thought to be lifeless desert. And we are destroying it. With climate change at our doorstep (or should we say, already burning our house down), it has become apparent that the linear mindset driving our society forward has been in place for far too long. To mitigate and adapt our lifestyles to climate change in the centuries to come, we must transition towards a circular, sustainability-driven mindset.

We started Biosphere at the end of 2021 based on the knowledge that our society needs individuals, start-ups, businesses, ideas and much more to push forward this transition to a sustainable world. Biosphere Solar, is our first project, developed due to the fact that humans today need energy for nearly all basic activities, and finding sustainable ways of sourcing that energy is crucial.

We are in the midst of an energy transition, and with solar modules now available on the market at increasingly low prices, we have the potential for harvesting clean electricity directly from sunlight. However, the photovoltaics (PV) industry possesses a large caveat: it has applied a linear mindset to manufacturing solar modules, making them incredibly energy- and cost- intensive to recycle, and impossible to repair or refurbish. The reason behind this is that solar module manufacturers laminate (usually using EVA) solar cells entirely, essentially glueing all the components in a module together; this laminate provides protection for the cells, but it also leads to rapid losses in efficiency through its yellowing. Not only that, but the glueing of it all together means repairs or upgrades are impossible, and so solar modules find themselves at their end-of-life (EoL) much earlier than they need to be. ([link](#))

The EoL of a solar module can take various forms - parts are sometimes recycled, many modules are landfilled, or they might just be incinerated for energy. All in all, the current EoL of a solar module looks quite bleak: recycling usually only includes glass and metal parts whilst the most precious (and CO2 intensive) component to make, the solar cells, are crushed up and used as fillers in products such as asphalt. ([link](#))

Research conducted so far has identified two major problems in the solar industry: the design flaw of solar modules making them linear, and the lack of infrastructure and knowledge regarding solar waste recycling. Although the latter is a crucial challenge to work on, it was clear to us that there are already parties working on it, whilst the form challenge is nearly entirely being ignored. ([link](#))

At Biosphere Solar, we therefore aim to make solar module production circular by design. But as is quickly becoming apparent, circularity is bigger than products themselves – circularity includes the entire supply chain, as well as the business model and goals of a company. And so, we are working not only on redesigning solar modules, but also on disrupting the (solar) industry as a whole to bring about a change in 'business as usual'. Acting as a global initiative of researchers, entrepreneurs and change-oriented individuals, we are bringing circularity to the solar industry, one player at a time.

2. Mission & Vision

Our vision is that of a world where the technosphere and the biosphere are brought in symbiotic relationship with one another; a world where solar energy and biodiversity regeneration work together, and the use of open-source hardware solar design enables rapid and resilient adaptations to be developed. This vision is guiding us to the development of an open-source, circular, and fair solar module: as Biosphere Solar, we aim to provide the knowledge and necessary push for the solar industry to transition away from its current business model.

3. Product

3.1. Scope of the product

We strive to make it the norm for solar panels to be designed modularly and with fairness all along the supply chain.

3.2. Product Requirements

We have identified two key components which will help us realise this scope:

- Fairness – having our components ethically sourced
- Circularity – having both a circular supply chain and product

Additionally, we have chosen specific design requirements for each version of our product, which you can see in Table 1. These are used as a guideline to help us achieve our overarching scope of a fair and circular product.

Table 1. Design requirements based on prototypes

	Modular	Repairable	Upgradeable	High-quality recyclable	Certified for sales	Price Competitive	Locally sourced component	Lightweight
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V.0 - prototype								
V.1 - Minimum Viable product								
V.2 - competitive Design								
V.3 - Locally disruptive Design								
V.4 - Globally Disruptive Design								

3.3. Timeline

In Figure 1, you can see the rough timeline we have shaped for the coming 3 years of Biosphere Solar. If you think you can help us reach some of these milestones or you want to be a part of our journey, contact us!



Figure 1. Rough timeline of Biosphere Solar's future

4. Project Structure

4.1. Company values

As a start-up that is impact-driven and non-profit oriented, we aim to make the culture we cultivate *within* our business just as positively impactful as

what we do *without*. As such, we highlight here a set of values which reflects on the decision-making, everyday-running, and future-dreaming of our start-up.

Every individual who partakes in this project becomes part of our team structure. There is no 'I' in 'Team', and the importance of supporting all those working towards a unified goal cannot be understated. For this to work, **transparency** is key. Transparency about what everyone does/is doing, where the responsibilities are distributed, where money is used, any conflicts arising, etc.

Our goal is to therefore create a **safe space** in which everyone is able to speak up and feel safe whilst doing so. For this to work, all those who partake in Biosphere Solar must take **ownership** of how they behave, feel, and what they do. Through this, open-communication can begin to take place. This means speaking in terms of 'I am feeling...' rather than 'You are making me feel...'. It also means trusting that those around us will support us to the best of their ability if we ask for help or guidance.

Something we keep in mind at all times is that a team works best when everyone is **enjoying** what they're doing, and is **passionate** about it. So we aim to provide a space that is flexible enough for people to experiment and have fun, whilst also being structured enough to obtain results.

Key to Biosphere Solar's internal vision of cultivating an impactful business, is wanting to support our (team members') needs. Naturally, money fluctuates, and so we have adopted the approach of observing **money as a transaction** (and certainly not a goal), which can support the reaching of milestones, and provide for the needs of people along the way. This means that money received is provided to the channels which require it most to have as large an impact as possible. Whether this means being used to purchase a (fair-trade, slavery-free) chocolate bar for the team-meetings to stimulate fruitful discussions or solar glass for the next solar modules.

On the topic of money: Biosphere Solar is advocating for a **new system**, a circular system. As such, collaborating with companies and initiatives still supporting the redundant fossil-fuel era and linear mindset of our past (for example Shell, BP, Rabobank, etc) is not an option. We do not support greenwashing, gaslighting nor any form of actions which further encourage the destruction of our world. What we *do support* are fair, regenerative, and circular initiatives.

4.2. Biosphere team

The task of disrupting the solar industry and bringing to it circularity is a great challenge. For this, we require a strong team and structure which can carry such a task. We have developed a framework to suggest how individuals (globally) can contribute to this project; this framework is seen below (Fig 1).

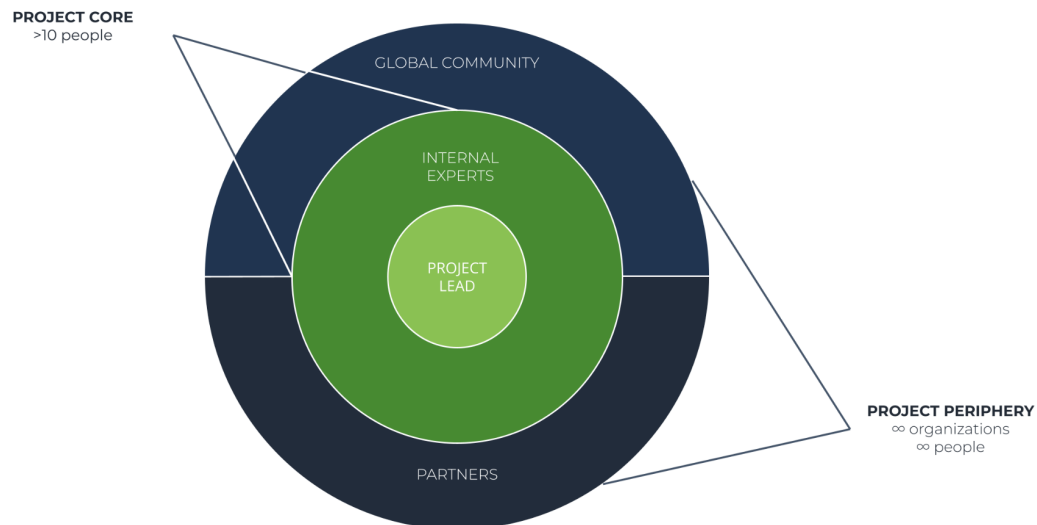


Figure 2: Project structure overview

At the core of our project (Project Core), we have Project Leads - these are the individuals who have an overview of the different projects and sub-projects being undertaken within Biosphere Solar's Project Core. We also have our Internal Experts who take on specific technical challenges related to the design of our solar module, or business development.

As mentioned, this challenge is much bigger than what a small group of people can tackle on their own, and so we also have a Global Community of individuals contributing from far and wide to our project. These individuals whether they be partaking in Biosphere Solar alone or in groups, are working on either further development of the prototype, or on setting up their own projects/start-ups based on the core challenge of initiating a circular revolution in the solar industry.

Those who are a part of our Global Community we want to encourage in feeling ownership of the project: each individual is a piece of the larger puzzle.

Naturally, changing the solar industry requires partners of all kinds. As such, we are also working with partners who have a symbiotic mission to ours from all across the globe, and from various industries. These are part of our framework within our project periphery, and include partners such as those

working on recycling of solar cells, or providing fair and non-toxic solar glass.

4.3. Methodology (how are we going to make it work)

4.3.1. Iteration Process

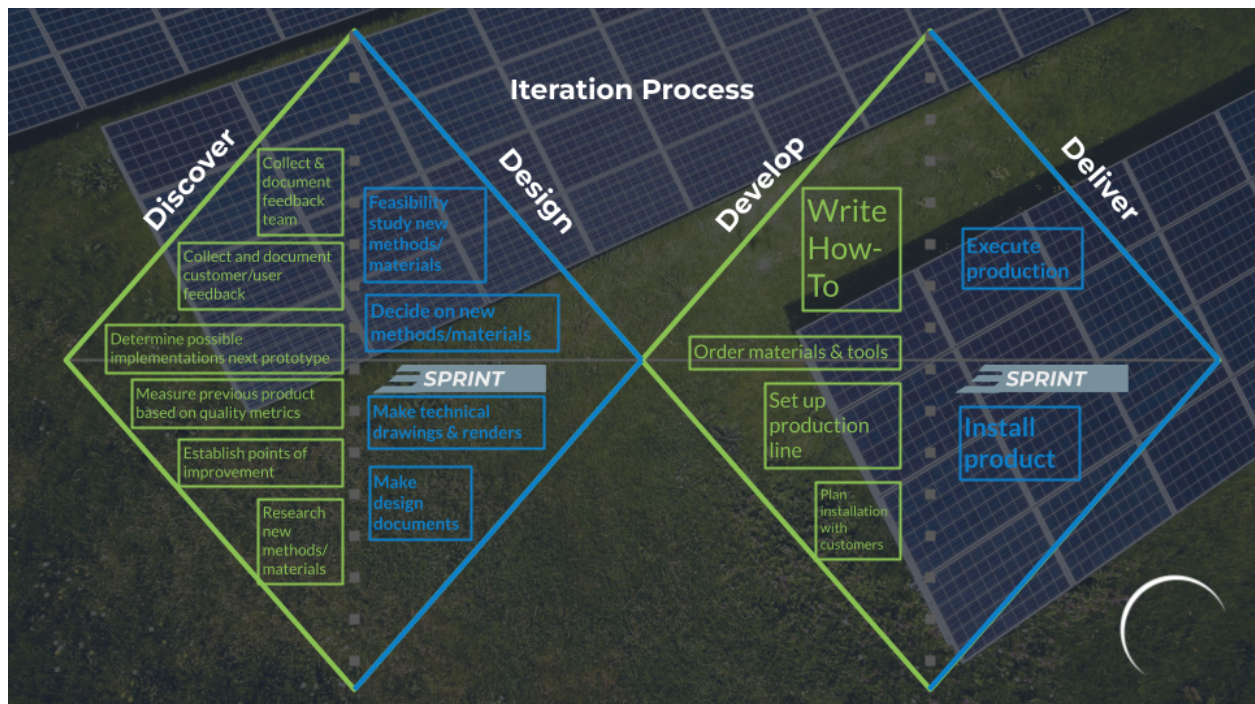


Figure 3: Iteration process employed by Biosphere Solar to ensure we are structured enough to deliver in time

In order to rapidly and effectively iterate towards better products, our process is divided into four phases, as shown in the Double Diamond model above:

1. Discover
2. Design
3. Develop
4. Deliver

The discover and develop phase are diverging phases, meaning that they are characterised by brainstorming and ideation. The design and deliver phases are converging phases, or sprints, characterized by setting concrete goals, deliverables and deadlines. In the diagram, the key activities of each phase are shown. By alternating these two types of phase, Biosphere aims to create a productive flow for building products and prototypes.

In the small-scale prototyping phase of our start-up, these phases will take place consecutively. As we grow, these phases can occur in parallel as specialising departments will emerge that specifically focus on design, installation or supply chain management.

4.3.2. Open-Source

What does it mean to be Open-Source? Why are you Open-Source? Aren't you scared of someone stealing your idea? These are some of the questions we hear most often when presenting our business. So let's answer them here right now.

Being an Open-Source Hardware project means everything we do is available for you to use, build upon, and give feedback on. No matter who you are, or what you do, you have access to our documentation and learnings. This means you also have the opportunity to contribute and become a part of our community. Why do we do this? Because we believe that the best projects and products come from team-work. We believe that we are few of many individuals scattered across the globe that want and can make a difference, if only given the opportunity to collaborate. Not only that, we have also seen the first examples of successful Open-Source (Hardware) initiatives (such as [Precious Plastic](#), [Prusa](#), [Arduino](#), [RepRap](#), [LumenPnP](#), [Plastic Scanner](#), and many more), and gotten inspired by their large-scale impact.

After decades of a capitalist system which was very useful for a world ravaged by war, the dysfunctional symptoms of capitalism are becoming apparent (climate change, biodiversity loss, ecosystem destructions, etc). So, a new system needs to emerge. Even though some find it easier to envision the end of the world rather than the end of capitalism, it's only natural that it be replaced by something more suitable to the times. And we believe Open-Source has a role to play in that new system.

To ensure huge corporations and/or individuals with patenting intentions in mind don't take over the open designs we create, everything is protected under the [CERN-OHL-S-v2](#) licence. This license prevents anyone from patenting the designs we have made available, and also ensures that any developments and future innovations based on our initial design must also be released open-source, under the same license or one even less restrictive. So rather than 'stealing' our idea, we encourage everyone to 'borrow' it, learn from it, and improve it.

4.4. Call to Action

Our Biosphere Solar team is always on the lookout for new collaborations and individuals who want to bring circularity to the solar industry. So let's talk

about how YOU can contribute to the various (research) challenges we might have.

Whether you're a student, architect, designer, film-maker, artist, youth, elder, etc., we believe you have something of value. Therefore, on our website (www.biosphere.solar/contribute/) are described the different places in which you might find your role. Our website is up-to-date on the various challenges we offer, but naturally we encourage you to reach out if you find you are interested in something other than what is proposed.

Additionally, we have set up a [Wikifactory page](#) which you might find interesting for understanding more of how our product is made.

We want to take one final paragraph to thank you and further galvanise you. At Biosphere Solar, we are envisioning and building a world where needs are met within the planetary boundaries of Mother Earth. If you want to build that world with us, we welcome you with open arms. It's past time for talking about change: we need to act upon our words, and promptly bring change to our lives. No matter where you are and who you are, you have all the power and capabilities necessary for making that change. And if you need support, guidance, suggestions, etc., then we're here for you.

We're looking forward to hearing, meeting, seeing you!