SUNTEAN

...protean buildings for a thriving future

Next level

SolaRoof Technology Solutions

Buildings where all live can thrive.

Protean:
Resembling the Greek God Proteus
in having a varied nature or ability to assume different forms;
displaying great diversity or variety;
versatile.

Versatile, because these buildings have:

1) Transparent Roofs (only roof or also walls).

2) Super efficient, cheap & dynamic insulation

that can be used only when needed.

3) Hardly need energy for comfort and in-built solar collection.

That works fantastic for all and everything!

The main enabler to achieve exceptionally energy efficient buildings are:

Nerdy stuff: The insulating effect is the same as still air, but bubbles counter out the convection effect; thus achieving a U-value of 0,05 for 50cm cavity (0.025 is measured for 100cm).

So.. ..finally there is an affordable option for large buildings with

both good insulation effect & plenty of daylight!

This is an industrial greenhouse wiring set-up for that, but you get the drift.

Our main focus *is*
greenhouses for plants, algae or both.

Protecting the most sensitive forms of live from heat cold,
and excessive sunlight *if* that is an issue ..

..with energy usage that can bring food security to all and unleash the power of algae.

But sure.. ask us about any kind of roof or building.

BASICS ON HOW IT WORKS

1) Soap bubbles create effective and dynamic insulation that can be **deployed at need** for insulation or shading; or removed entirely for maximum sunlight.

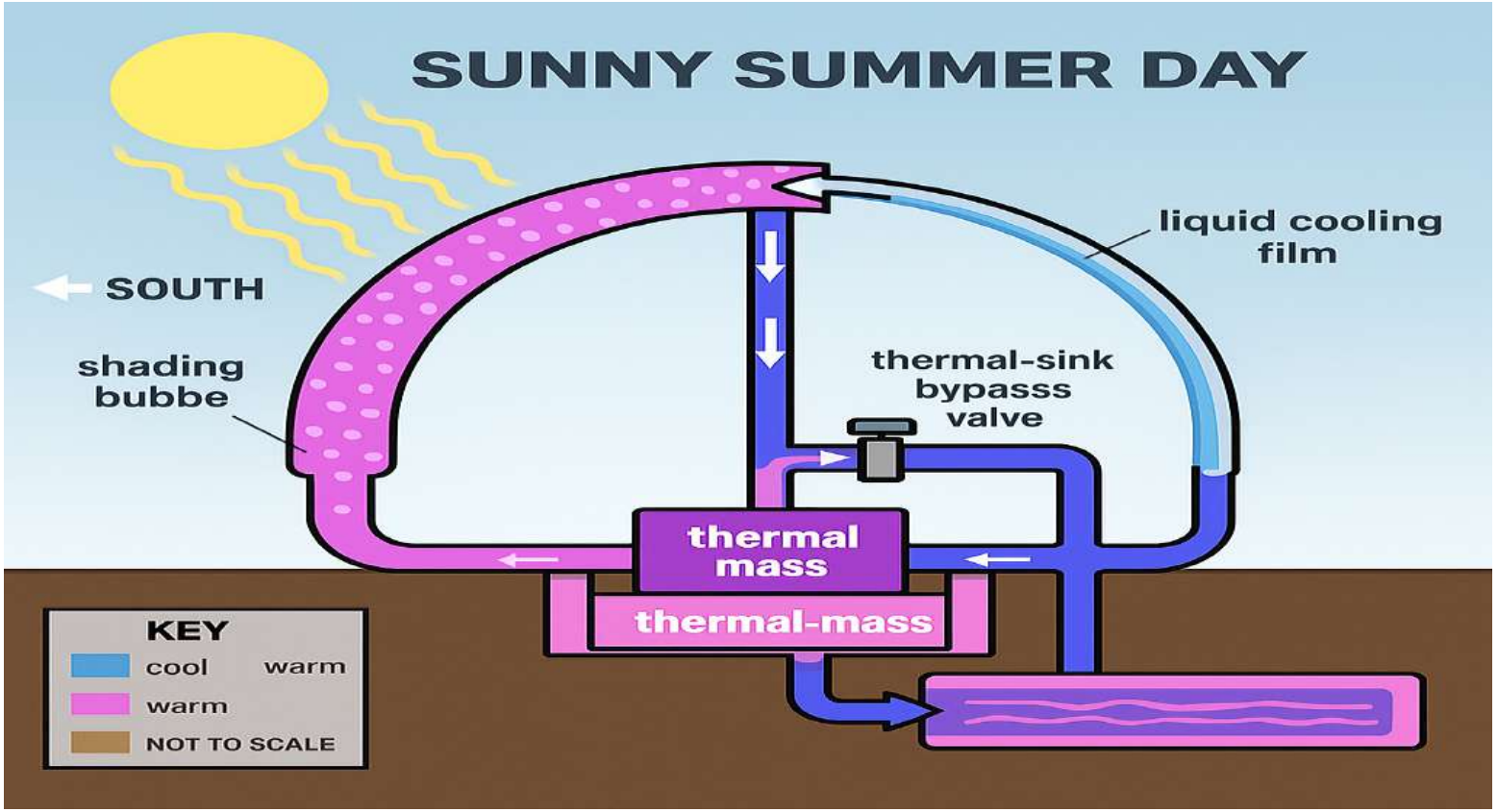

DivisionQ, Holland


PoznanUniLifeScience, Polen

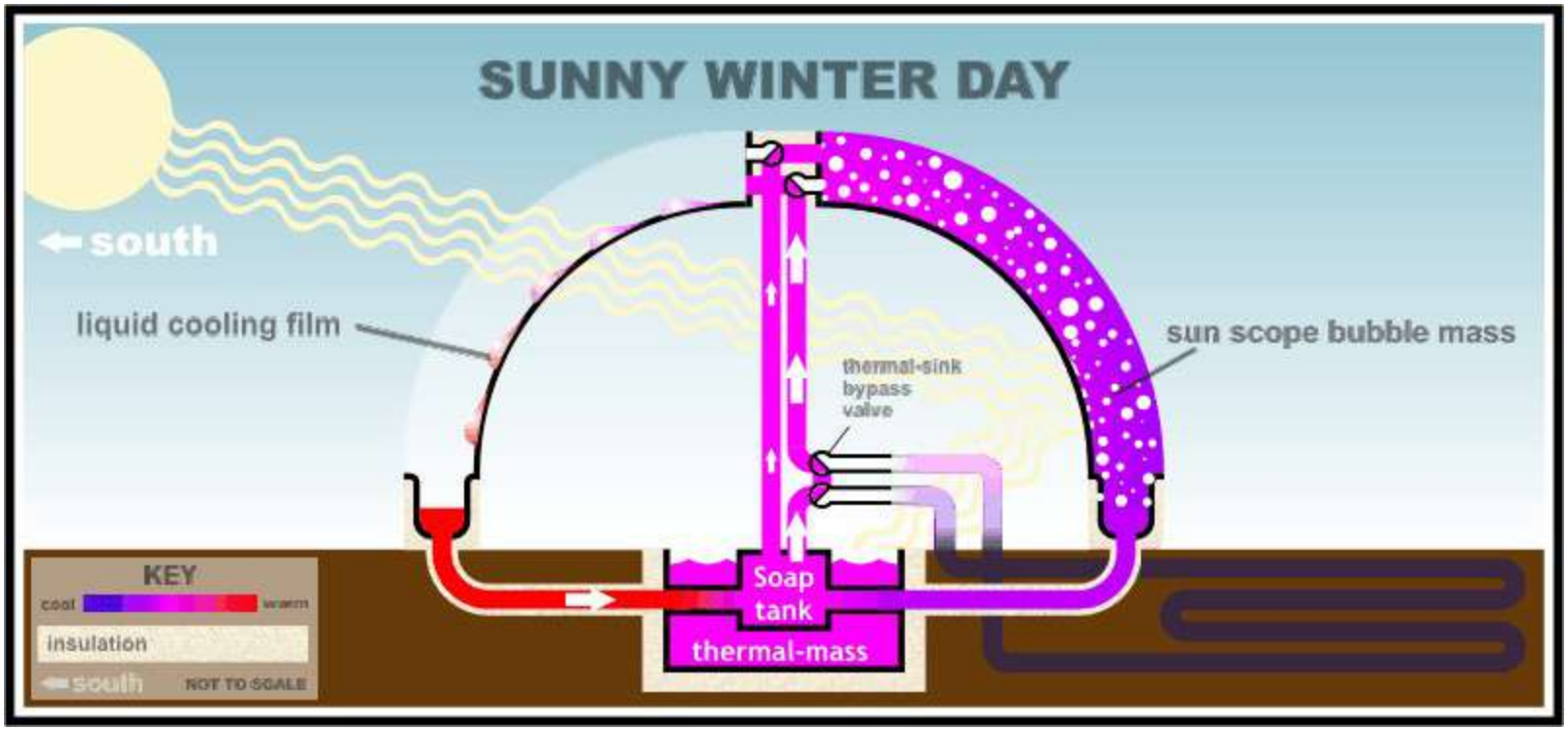
2) Soap liquid circulates together with, or alone, in the cavity **removes heat for storage** as well as being an efficient **humidity control** measure.

Suntean has greatly improved the cooling mechanism as well as the overall design, performance and cost of previous SolaRoof projects, such as the above by BBBLS.

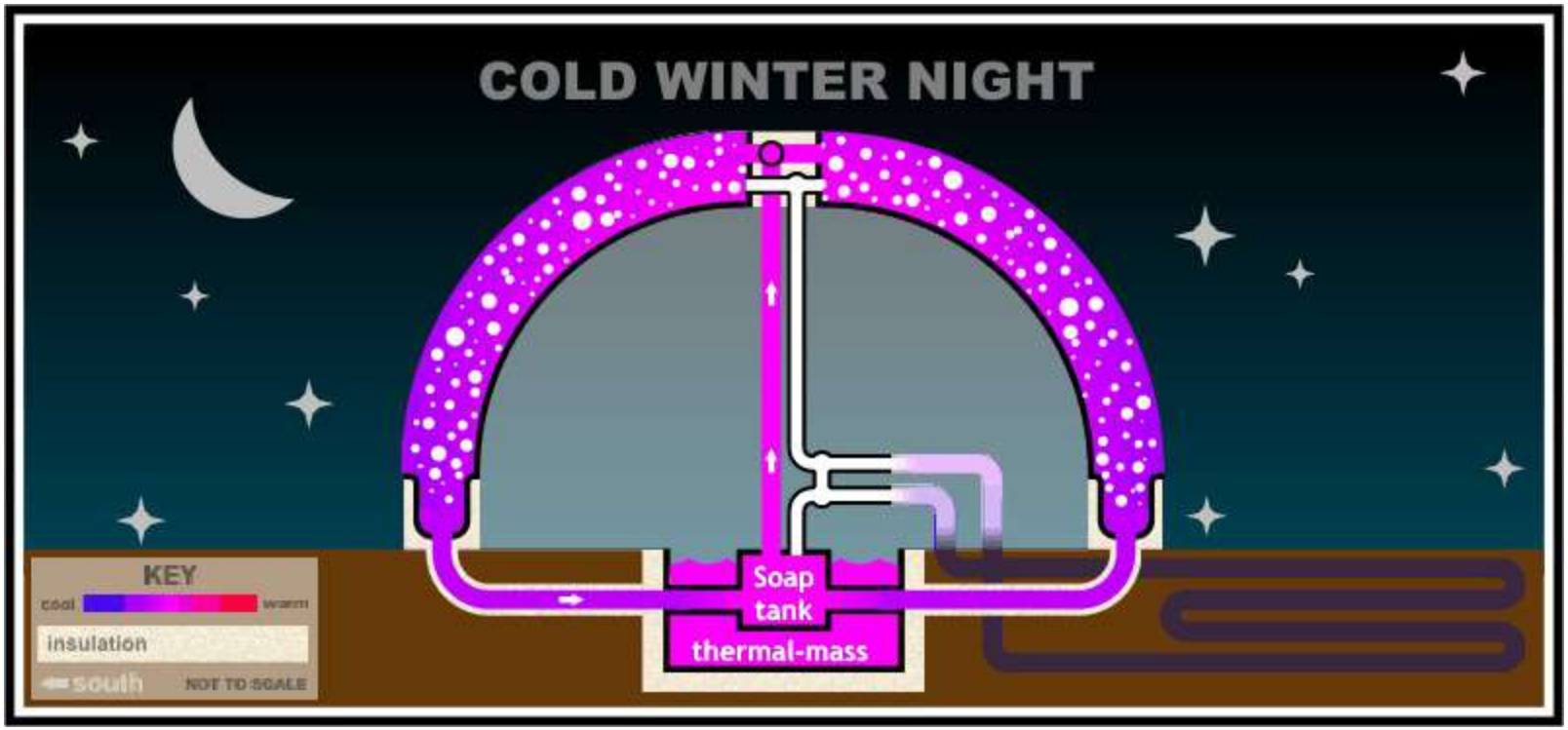
Simplified illustration of the basic principles:



Shading during daytime with bubbles if shading is required.
Cooling and dehumidification with liquid film can take place in the South and/or North.
Supplementary cooling methods are used for closed production.



Liquid Solar Technology in the South.
Insulation and light reflection in the North cavity.
Also LST in the North if needed for humidity control.



Liquid Bubble Insulation in the whole building envelope.
Bubble renewal before cold air reaches the inner layer.
LTS only in hot climates to cool the thermal mass.

Videolink to news rapport from the BBBLS greenhouse in Sem, Norway

https://tv.nrk.no/serie/distriktsnyheter-oestafjells/201812/DKTE97121018/avspiller

The projects by BBBLS validate the insulation capabilities of soap bubbles, but lacking in cooling capacity.

Suntean has nailed a design to handle heating, cooling & humidity control.

There are several SolaRoof school demos in Norway by BBBLS;

at the Life Science University NMBU, Ås; Vestsiden Upper Secondary, Kongsberg and Sydskogen Primary School, Asker.

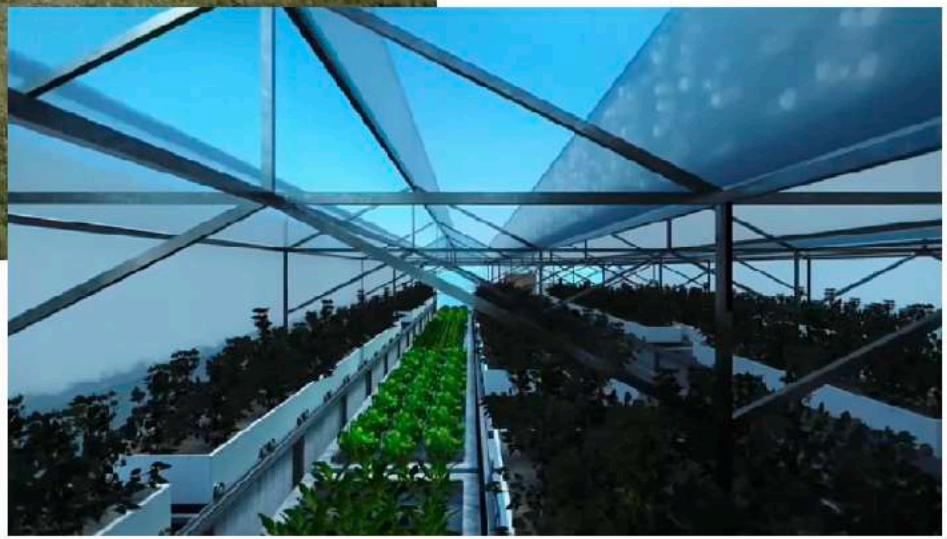
Video by TG Electro & Automasjon of the BBBLS school greenhouse at Vestsiden Ungdomsskole in Kongsberg

https://www.youtube.com/watch?v=CdBFxPJJDVU

Suntean is adding cooling mechanisms, and reducing cost significantly.

Modular multipurpose greenhouse / flat roofs

Fast to erect
& very low
running cost



Designed for
Venlo conversion

Our roof cavity enables efficient snow melting,
but we offer pitch roof options for areas with heavy snow load for added security.

SolaRoof is a perfect match with hydroponic as large thermal mass reduce the energy needs..

Yields in Lettuce Production

SolaRoof enable

Controlled Environment Agriculture (CEA)

CEA =

CLIMATE CONTROL WITHOUT VENTILATION

NB! This requires a large liquid thermal mass (0,5-2,5m3/m2), connection to an external heat sink or access to cool water.

- Remove CO2 wastage (normally over 60% escapes through ventilation).
- Efficient dehumidification by controlled condensation. Restricting access for insects/pests entering the greenhouse.
- CEA enable capturing of transpiration.

SolaRoof can be a significant element in many circular economy set-ups for beneficial use of nutrients and CO_2 from industry, biogass production, fish farming, waste heat and natural cooling.

Our Carbon Capture & Utilisation capacity is significantly higher than other greenhouses due to our cost efficient possibility for closed environment production in most climatic conditions.

SolaRoof is a perfect fit with fluoropolymers!

Fluoropolymers, one being ETFE (Ethylene tetrafluoroethylene), are transparent materials known for their exceptional properties. They are lightweight and highly durable materials that offers various benefits in different applications. ETFE is widely used in architectural, construction, and engineering projects for its remarkable performance characteristics. It is a popular choice for applications where high light and UV transmission are required

Ceres Aquaponic Design

Normal 5 layer ETFE = U-value 1
With SolaRoof, only two layers of ETFE will give a much lower value depending on the thickness of the cavity >0.025
1R / Inch (50cm = 0.05 / 1m = 0.025)

Skylight by Vector Foiltec

Cost-Benefit Ratio

M2 cost of our green-/house solutions depend on several factors;
climate, size, choice of cover material and use (semi-closed or fully closed).

We estimate a CAPEX increase between 20-70%,
but with only a fraction of the energy requirement for stable temperature and low humidity.
Thus, enabling far better growth conditions and a ROI many times faster than alternatives.

This is comparison to production with standard ventilation;
not taking into account the added benefits of heightened concentration of CO_2 due
to semi-closed or fully closed production.

Norwegian Senario

Energy requirements in Norwegian greenhouses from Norsk Gartnerforbund

Normalt energiforbruk i et gjennomsnittsgartneri. Tallene kan variere sterkt rundt dette avhengig av sted i landet og valgt produksjonsmetode.

		Produksjonsperiode		lys pr åm2	Varme pr åm2	Sum energi pr m² i året
	avling pr m2	fra uke	til uke	kWh	kWh	kWh
kultur	kg, stk					
Tomat, stor rund	45	8	44	0	400	400
Tomat, cherry	25	8	44	0	400	400
Agurk	55	8	44	0	560	560
						0
						0
Tomat helårs	115	1	52	900	310	1210
Agurk helårs med lys	160	1	52	1000	450	1450
						0
Krydder i potter	210	1	52	225	275	500
Blomster m varmepumpe				90	250	340

Varme i veksthuset kan leveres av naturgass, biogass,skogsflis, pellets, elkjele, varmepumpe eller propan. Mineralolje er forbudt etter 2025, men kan fram til det brukes som spisslast på kalde dager.

I et gartneri med flisfyring vil typisk 90 % av årsbehovet dekkes av denne energikilden ved normal dimensjonering. Resten er spisslast i form av el eller gass.

I et gartneri med varmepumpe vil typisk 66 % av årsbehovet dekkes av denne energikilden ved normal dimensjonering. Resten er spisslast i form av el eller gass.

We estimate an energy requirement of **55-120 kWh per m² per year**

to maintain a stable temperature of 20-25°C year round (not including lighting).

Suntean targets several high-growth markets

1. Climate controlled greenhouses:

The global commercial greenhouse market was valued at USD 50.53 billion in 2025 and is projected to hit USD 139.11 billion by 2034, registering a CAGR of 11.19% from 2025 to 2034. The global commercial greenhouse market growth is attributed to the increasing demand for commercial services and solutions. Source: https://www.marketsandmarkets.com/Market-Reports/commercial-greenhouse-market-221045451.html

2. Urban Farming:

The global urban farming market size was valued at approximately USD 160.22 billion in 2024 and is expected to reach USD 312.44 billion by 2033, growing at a compound annual growth rate (CAGR) of about 7.7% from 2025 to 2033. Source: https://www.businessresearchinsights.com/market-reports/urban-farming-market-102796

3. Micro Algae

The global micro algae market size was valued at USD 782.59 million in 2024. The market is projected to grow from USD 841.30 million in 2025 to USD 1,376.42 million by 2032, exhibiting a CAGR of 7.29% during the forecast period. Micro algae species have a diverse range of applications in various industries, including the food and feed industry. The global market has recorded significant growth in recent years, driven by the increasing research and development and applications in different industries, especially in the food and feed industry. It is rich with nutritional elements such as protein and vitamins, is one of the prominent factors contributing to the growing interest of food and feed manufacturers toward microphytes as an ingredient. Source: https://www.fortunebusinessinsights.com/microalgae-market-110314

5. Smart Cities 6. Energy improvements of buildings 7. Humanitarian Aid

Income streams:

1) Greenhouse systems with integrated heating, cooling and shading.
2) Turnkey solutions for plant- or plant&algae production in circular production set-ups and as Carbon Capture & Utilisation. We have our own patent pending for plant&algae in combination.
3) Algae. We will develop several patentable methods for dense algae production in closed production greenhouses, and sell algae to different markets, including combined production strategies.
4) Algae production licenses connect with both 2) and 3).
5) Training. Predominantly for companies wanting to buy into our algae franchise/licensing.
6) Various off-shoot products beyond greenhouses.. when we have that under control; such as smaller units for private, emergency relief, semi-permanent natur base housing for nature restoration, ecovillages, guest houses, and other products base on soap bubbles.
7) Consultancy for the built environment.

Status:

* We have just finalised design details, estimated cost, delivery partners and estimated energy needs.

* We are ready to apply for a NOK1M grant from Innovation Norway as Phase 2 of Start-Up support.

* Dialogue with Holsfjord Products for a 9x60m demonstration nursery greenhouse for salat, cabbage, kale and algae.

* NOK12M Grant submitted by Margarida Costa at NIVA for our solutions as enabling technology for algae production.

* Draft to Green Platform submitted. Grants in this call is in the order between NOK30-80M.

* Invitation to collaborate with Biopharmia for their photobioreactors in our greenhouse connected with the biogass plant at Romerike as a Green Plattform project.

* Dialog with Elise Sæle Dahle for collaboration on the Green Plattform project connected with the biogass plant at Voss.

* Invitation to become the algae producing partner in a E9M land-based fish farming project in Ghana with connection to Norwegian Ghanaian Chamber of Commerce.

* Karoline Kvalsvik at NORCE is validating our solutions form an energy point of view.

* The greenhouse team at Norsk Gartner Forbund is validating our solutions.

* The algae team at NIBIO is eager to join applications for demonstration of the energy efficiency of our solutions for alge production in general, as well as to conduct R&D of our own algae production methods.

* Industrial zones are eager to team up for utilization of CO_2 for plant and/or algae production.

* We need investment for match money, salaries and to follow up the above and many other possibilities now on the table.

Our key team members are:

Anne Helene Wirstad

CEO; 20 years experience with SolaRoof;
CEO of Life Synthesis; initiator of the EU project Food 2 Waste 2 Food; initiator and co-Founder of BBBLS;
Sales / Marketing in London.

Jørgen Wille

Economist; Building Engineer; Master Carpenter; Pioneer within energy efficiency in buildings.

Xavier Dequaire, Norway/France: Engineering

PhD level Solar Energy and Passive House expert; IT developer.

Anders H. Bjerknes, Norway, Australia: Engineering

Entrepreneurship; Automation; Project Management; Lean Manufacturing; Electrician.

Pat McCann, Paris/USA: Strategy / Marketing
Peter Bulsing, Holland: Standardisation / Commercialisation
Anna Bxxxx, Norway (?): Contracting / PR /Communications /HR

Delivery Partners:

CERES GREENHOUSE SOLUTIONS®

MAX FORDHAM

RICHEL® GROUP

Norhage INDUSTRI

NOWOFOL®

PROTAN

WTEX

unger

+GF+ GEORG FISCHER

STORM HALVORSEN

RAIN BIRD

PLASTIKA KRITIS S.A.

NorLense

EVOLYS®

TECNOGAZ

Research Partners:

NIVA Norsk institutt for vannforskning

NIBIO NORWEGIAN INSTITUTE OF BIOECONOMY RESEARCH

NORCE

NMBU Norwegian University of Life Sciences

We unlock the potential of SolaRoof for
ecological life support and life supportive living.

Our potential contributions to help solve the SDGs are broad:

Suntean has enormous potential to help achieve the SDGs in multiple ways by bringing SolaRoof to market with our own commercial products as well as extensive efforts to make the Open Source aspects of the technology accessible for self builders and humanitarian use.

It can **reduces CO2 emissions**, **water** usage and water pollution from the agricultural sector significantly.

SolaRoof is ideal for **algae production** which can help solve several SDGs alone.

SolaRoof provide affordable and comfortable **housing** with **food production** and **job/income generation**.

SolaRoof on rooftops in **cities** can reduce the hot roof issues and heat island effect.

SolaRoof buildings and greenhouses can be a significant catalyst for expansive **nature regeneration.**

SUNTEAN

...protean buildings for a thriving future

Co-creating global sustainability and
and a future that all can celebrate.

WWW.SUNTEAN.COM