A Business Model for Industrial Symbiosis

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The business model has been partially developed, studied and described in the Horizon 2020 project CORALIS.
The first stages of development were made in the ReProFood project supported by Vinnova, 2015-2017

http://reprofood.com/

*RePro Food is short for “Recirculating Production and Processing of Vegetables and Fish” (in Swedish “Kretsloppsbasad produktion och förädlign av grönsaker och fisk”), a 20 MSEK development project with eight partners supported by Swedish Governmental Agency for Innovation Systems (VINNOVA), project reference number 2015-04412.
WARM

Bringing waste to life
We identify, develop and finance circular businesses with industrial scale impact for people, planet and profit.

Develop and finance industrial-scale business opportunities based on industrial waste streams.

Products such as food, feed, fuel and materials create real value and can readily be produced based on industrial waste streams.

Bringing waste to life:

Industry typically has a cost for waste and the waste may also limit growth. WA3RM makes a business out of flipping the cost to an income.
The Regenergy Frövi project: 20 ha of food production based on waste heat

Greenhouse size: 10 hectares
Annual tomatoes production: 8,000 tonnes
Waste heat: 10MW at 45°C
Water consumption: 1,000 m³/day max
(50% from rainwater)
Electricity: 12MW

Prawn farm size: 10 hectares
Annual prawns production: 4,000 tonnes
Waste heat: 5MW at 45°C
Water consumption: 680 m³/day
Electricity: 4MW

50 GWh
Recycled energy: 50 GWh per year

–12,515
Total reduction of carbon dioxide: 12,515 tonnes per year

Total investment and annual growth: 1250/343 million SEK

220
Number of new full-time jobs: 220
WA3RM develops projects by matching waste streams to users, maximising value and impact, and managing complexity

**WA3RM’s development model**
MATCH, MAXIMISE, MANAGE

**Match**
Waste streams with businesses that can use them as a resource

**Maximise**
Impact and value
+ Market-focused project selection
+ Best in class grower partners attracted
+ Mature tech
+ Long-term contracts

**Manage**
The added level of complexity in symbiosis

**Waste heat**
Project development typically takes 3 years

**Phase 1: Generation**
- Screening
- LOI Industry / WA3RM
- LOI Tenant(s)

**Phase 2: Development**
- Land access agreement
- Budgeting
- System design
- Facility design
- Facility procurement (RFQ)
- Building Permit
- Electrical grid connection
- Land agreement
- Financing
- Tenant(s) agreement(s)

**Phase 3: Execution**
- Construction

**Regenenergy Project Process map**

**YEAR 1**
1 2 3 4 5 6 7 8 9 10 11 12

**YEAR 2**
1 2 3 4 5 6 7 8 9 10 11 12

**YEAR 3**
1 2 3 4 5 6 7 8 9 10 11 12

**YEAR 4**
1 2 3 4 5 6
The RePro Food project identified that neither the businesses that could utilise waste streams or the anchor industries, typically could or would finance the needed infrastructure.

Financial Instruments for Regenerative Industry Infrastructure

- **Status**: Preliminary investigations
- **The challenge**: International studies show that bank financing for large-scale greenhouses is limited to between 50 and 70 percent of the project total, meaning that that between 30 and 50 percent of the needed capital must be supplied by equity, unless a tier of financing in between can be identified, often called mezzanine financing. Although typically more expensive than bank loans, mezzanine financing would still have lower yield demands than equity, thereby improving the economic viability of the facility.
- **Progress**: Two types of mezzanine financing have been explored in preliminary investigations, government programs to support sustainability investments and private issues of bonds, where so called green bonds and also resilience bonds are of interest.
The scope of the financial model is the entire infrastructure, reaching into the industry to capture the waste stream and including all of the growing or farming facility.

- The financial model covers the entire infrastructure, from resource capture to growing/farming facility.
- ≈50 M€ price tags
- First fund = 150 M€
- Leverage + co-invests allows funding for ≈6 facilities
WA3RM’s partnership business model delivers business goal wins all around
For each partner, WA3RM offers a one-stop shop

1. WA3RM identifies and develops applications and projects

2. Local authorities like the job creating, sustainability and symbiosis with local industry

3. Industry partners sell their waste heat and other waste streams, thereby reducing their own costs and impacts

4. Waste resources are cheaper and less volatile than market commodities, attracting world class grower partners

5. Facilities are built to the specifications of world-class grower partners that become the tenants

6. Investors get excellent returns and the opportunity to make significant impact

7. For contribution to achievement of climate goals, projects receive guarantees for loans

8. An industrial symbiosis with winners all around is established
Conclusions and Opportunities

• Interest from institutional investors is keen - many desire to invest in sustainability and have great difficulty in finding investments

• The business model performs a service also to the financial sector

• The business model allows growers and farmers to scale-up without worrying about investment capital

• The cross-sectorial symbiosis projects which WA3RM is involved in would not happen without an external business model including development and financing

WA3RM’s business model is an open model – Whether you represent an industry, a business that can run on waste streams or a financier, you are welcome to join
There is no time to waste