



# PRISMA PILOTS RRI ROADMAPS: **BISIGIDOS**

CEN workshop background document

May 2019



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710059. The opinions expressed in this document reflect only the author's view and in no way reflect the European Commission's opinions. The European Commission is not responsible for any use that may be made of the information it contains.

## The Company

The EU project BISIGODOS aimed to identify ways to use algae as a feedstock in order to produce valuable chemicals, amino acids and high added-value bio-resins that would normally be produced using petrochemicals. The algae biomass can be fed directly with CO<sub>2</sub> from industrial emissions (cement, steel factory, thermal power plants, etc.) as a raw material that is cost-effective and renewable. The process is assisted by solar radiation, nutrients and sea water microalgae. The consortium brought together expertise and resources within the areas of: microalgae and photo-bioreactors production and optimization, manufacture of amino acids for food products, production of conductive polymer coatings, bio-resin development for water-based inks, bio-surfactants production and bio-PU adhesives manufacturing, and end-users in the food, flexible packaging, hair care, metal industry and paints products.

This PRISMA pilot has a different approach compared to the other pilots. The work has been retrospective, looking and analyzing from an RRI perspective activities and results of the EU project BISIGODOS. The work will be informative for the development of future initiatives of partners, and as well as setting research calls in this field, especially within the EU science funding context.

### RRI commitment

- The RRI PRISMA pilot has been endorsed by the project coordinator and the project partners
- Motivation for RRI: better understanding of the ethical, social and legal issues and stakeholder expectations the technology faces; and better alignment for future bids for research funding

### Context

- Type of pilot organization: public-private partnership (EU funded research project)
- Country: UK
- R&I project selected:
- Technology: industrial biotechnologies
- Regulatory regimes relevant for the R&I project: IPR protection frameworks
- Type of R&I activities: cooperative research
- Type of business: business to business
- Time to Market (indicative): not applicable
- RRI Maturity Level: Defensive

### Materiality & experimentation

- a. Key stakeholders: research organizations, companies involved in chemicals, adhesives, coatings, ink, surfactants, food, consumer groups, other industry actors, investors, policy makers, media and the public, companies involved in the end-of-waste and recycling sector
- b. Key ethical, legal and social issues: profit and short/long term research vs improvement of environmental and social and economic impact, issues of cooperation amongst partners, Intellectual property rights aspects, transparency
- c. RRI actions selected for the PRISMA pilots: embedded ethicist

### Validation aspects (key performance indicators)

- d. The most significant criteria identified with the company to analysis and monitor over time the impacts (in terms of costs & benefits) of the RRI actions on the Bisigodos project are<sup>10</sup>
- i. Q1.2: Feasibility of the technology solution; Q1.4: Product quality;
  - ii. Q2.3: Product environmental sustainability; Q2.7: Trust with/avoid conflicts with business partners, suppliers and end-users
  - iii. Q3.7: Fulfil ethical and social requirements (e.g. for access to funding)
  - iv. Q4.2: Team cooperation and motivation for product development; Q4.3: Address regulatory barrier
  - v. Q5.1: Product cost; Q5.2: Time to market;
  - vi. Q6: RRI action costs: Direct costs to perform the RRI action

## RRI Roadmap

### RRI VISION:

Developing bio-based (algae) feedstock to replace petrol-chemicals feedstocks, based on RRI-aware Life Cycle Analysis and funding calls more specific on RRI demands: the vision is to ensure future projects on developing algal oil products would carry out richer Life Cycle Assessments that draw more widely on the range of LCA methods that are available, including greater input from external stakeholders.

Furthermore, it is envisaged that funding calls in this area will provide guidance for applicants on the RRI tools that they are expected to deploy, or attainments that they are expected to achieve.

### R&I Technologies and products

The five products developed on the project using algal oil were: adhesives, coatings, ink, surfactants, food. In the future, the project partners would aim at the general replacement of petrochemical feedstock with algae feedstock for consumer and industrial products

### Drivers and challenges for RRI

- e. **Consumer products produced without using petrochemicals, Lower resource usage, absorption of Co2.** The project aimed at developing ways to use algae in order to produce materials that would normally have a petrochemical basis. Aside from the advantages of moving away from petrochemical feedstocks in terms of sustainability and geopolitics, the methods developed in the project ultimately sought ways of making products that not only had a lower resource impact themselves but also would absorb the carbon dioxide emissions of other industries.
- f. **High-value consumer products.** The project focused on creating products that have high economic value such as life-style foodstuffs and toiletries. Such a focus is more likely drive the technology in the future, since the possibility of a profit is more likely to become real.

### Risks and barriers to be addressed by RRI actions

- g. **Early stage technology cannot achieve economies of scale.** As with any new technology development, the relatively small-scale production that took place in the project was unlikely to show economic viability in comparison to existing industrial methods. The life cycle and economic assessments carried out at the end of the project confirmed this.
- h. **Uncertainty about market or viability.** Since the pure resource case for the products can't be made at this stage, those developing them must depend on the analysis changing in the future. This may be through inherent improvements in the techniques themselves, newly discovered economies of

<sup>10</sup>For more details on the criteria for impact analysis used in this section, see PRISMA D5.1: Report on conditions for success of RRI uptake by industry

scale (perhaps in the production of algae), or in changes in the petrochemical markets, perhaps due limitations on the supply of crude oil or new governance structures favouring non-petrochemical methods.

- i. **Commercial imperative of partners.** The specifications for the products to be produced were made and controlled by the commercial partners on the project. While this had the advantage of ensuring that the project focused on producing products that may ultimately go to market, it had the disadvantage that only a relatively narrow range of stakeholders were involved at the coal face of deciding what the focus of production would be.
- j. **Experimental nature of project.** Not all of the products were possible to make as expected; the technology remains at a relatively early stage. It is therefore greatly aided by the university setting and the investment of outside funds.

## RRI actions

### Reflection & Anticipation

- k. **(Retrospectively) embedded ethicist:** The embedded ethicist approach was applied retrospectively in order to identify and analyse the ethical issues that arose, trying to extrapolate lessons for future similar projects. Such projects would benefit from the direct deployment of the embedded ethicist approach.
- l. **Implement Life Cycle Assessment, value assessment and social LCA:** The project involved a Life Cycle Assessment and a Value Assessment. From an RRI perspective this might be improved through making assessments that are anticipatory rather than merely retrospective, are stakeholder engaged, open access, and have explicitly socially-led goals and scope. Moreover, the assessment was carried out on the assumption that each product (surfactants, coatings, and so on) would be separately produced; it would be worthwhile also to see such assessments on the wider assumption that algal oils replaced petrochemical feedstocks in the economy more broadly.
- m. **'Anticipatory' assessments of technology,** to take into account economic or social value and indeed to draw out the values that are implicit in those carrying out the research

### Inclusiveness

- n. **Stakeholder engagement: work with research, business and social actors sharing values and create positive ethical networks.** Involve both internal stakeholders (e.g. corporate partners in project) and those outside of the technology with expertise on possible economic effects of deployment.

### Responsiveness

- o. **Implement user-centered design, user innovation, flexible and adaptive design, co-creation approaches,** involvement from the outset a wide range of stakeholders
- p. Performing LCA and S-LCA starting from the very early stages of design, considering the large part of environmental impact is locked in the design stage.

## Roadmap design

The aspects relevant for the uptake of RRI by the company have been synthesized in an overall diagram, following the visual approach described in the PRISMA exemplar roadmap (Figure 8).

The BISIGODOS pilot in PRISMA has been retrospective, looking at a project already finished. The recommendations and actions included in the roadmap could help to shape future calls in the field or could help research actors to find the best ways to implement RRI aspects in future projects.

The roadmap helps in understanding the value that RRI implementation could bring into product development. In future calls and projects, it will be essential to be more explicit about the actions needed to meet societal needs and expectations, in terms of stakeholder engagement, assessment of social, environmental, economic benefits or other aspects. And this is exactly what the action plan of the roadmap allows to do.

However, RRI implementation requires extra costs in product development, and therefore it is really important that addressing RRI aspects will become a requirement in future calls. This is the only way to ensure RRI implementation.

# PRISMA



