D4.1. Appendix No 9
Cluster of bio-based solutions classified as "big-scale technologies" (WP4, T4.2.1)

Disclaimer:

Scope: The appendix presents all the scoped solutions that were classified as "big-scale technologies". The information on individual solutions are presented in the form of the filled – up templates. Before presenting an individual solution, information is given on the Bio4HUMAN partner responsible for scoping the given solution, as well as on the Investigation Line of T.4.2.1., the solution results from. There is also information on the presence / lack of presence of the solution on the final List of 27 bio-based products and technologies.

Note: The templates were filled up by the Leaders of Investigation Line based on the gathered information. Empty spaces in the templates mean *"no information available on the given criterion"* or *"difficulty in assessing the utility functions of the given solution"*. The second reason was quite common in relation to the potential application of the given solution to the different supply chain stages of humanitarian interventions. The filled up templates were provided to PRO CIVIS for further initial analysis. At the stage of internal consultation – all the Bio4HUMAN partners were granted access to the presentation of the solutions and were asked to provide comments and opinions on the subject of the potential applicability and functionality of the solution in the context of solid waste management in the humanitarian interventions.

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The appendix No 9 includes presentation of the following 18 bio-based solutions:

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1. MixMatters – demonstration sites focusing on separating and valorising bio waste.

Responsible partner: AIMPLAS
INVESTIGATION LINE: II

Solution 1 **not on the final List**	**MixMatters**
Product / service	
Technology	X

I. Basic information

Description of functions
What is the effect or final product?

Establish three demonstration sites in Spain to focus on separating and valorising bio waste in order to reduce 21 tons of CO2 annually during the demonstration phase and in the end, producing six high-value products:

- Bioactive compounds.
- Powder ingredients.
- Sugar concentrates.
- Recombined proteins.
- Green fibres.
- Plastic monomers.

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Description of technology and TRL level (if applicable)

Mobile unit for automated separation of mixed agri-food waste and valorisation hub for treating the separated waste. TRL 6.

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Description of product/service and TRL level (if applicable)

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Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense

The integrated system proposed by the project has three different parts:
- Separation Unit: sorting and separating the feedstock.
- Decision Support System: optimizing the configuration and logistics.
- Valorization Hub: fixed biorefinery to treat the separated streams.

As a complex system, the size of investment should be high, as well as hard to implement on the final destination despite the fact that the separation unit is a modular-mobile unit. It should have a great logistics planification and also an industrial site where the Valorization Hub can be placed.

What kind of waste the solution is able to utilize or valorise?

Mixed bio-waste from greenhouses, wholescale market, and food & drink industry.

To what extent does the use of a given solution or technology depend on climatic conditions?

The climatic conditions do not affect to the technology of the project.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

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One of the parts of the integrated system is the Separation Unit, that is a mobile and modular building used for sorting and separating the feedstock.

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Solution owner and his willingness to provide detailed technical and technological data

Information about the outcomes is published on the website of the project **https://mixmatters.eu/resources/**

.....

Has the Life Cycle Analysis been already done for this solution?

No information found.

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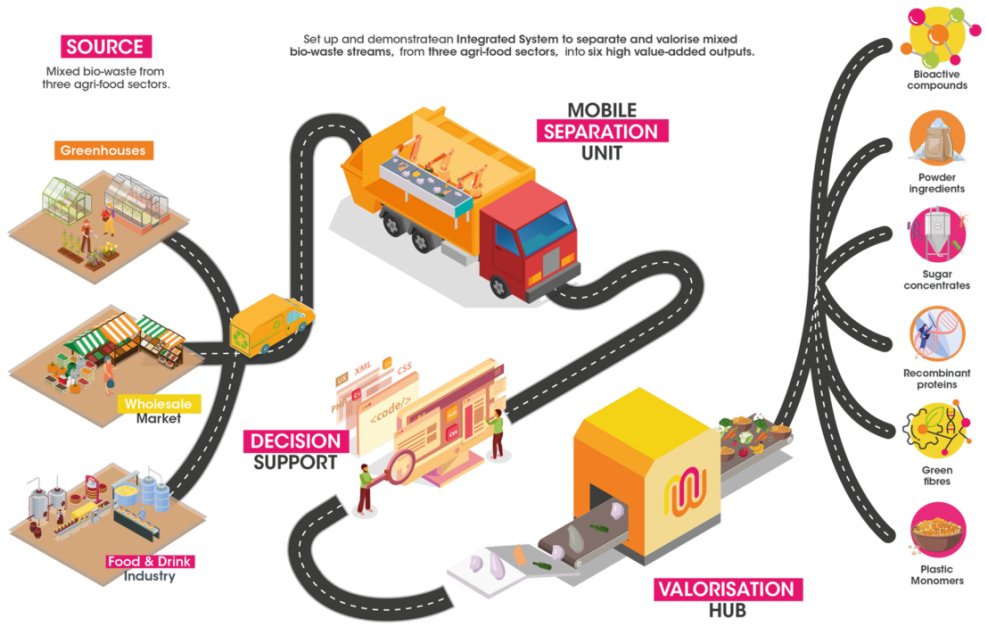
Source of data

https://mixmatters.eu/

.....

References

Please include a description and a photo of any examples of the implementation.



https://mixmatters.eu/resources/

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

Recycling and valorizing products from three different sources of mixed bio-waste agri-food sectors.

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III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:

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· *ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;*
· *sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;*
· *utilization of local resources and knowledge.*

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

Avoid landfilling and incineration of a high amount of mixed bio-waste.
Recycling plastic.
Reduce de carbon footprint.
Create 18 value chains and 6 high value-added products.

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IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

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Conceptualization and planning

Planning the integration of the system in the supply chain in order to giving it circularity avoiding reverse logistics creating high-value products.

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Procurement – sourcing/ purchasing of products and services

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Goods collection in warehouses and repacking for transport to final destination

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Custom clearance
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Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
Logistics between separation unit that receives bio-wastes from the supply chain, and the valorization hub where the high-value products chain starts. .....

2. Plant for integrating biodigestion, gasification and solar technologies for recovering energy.

Responsible partner: ITENE
INVESTIGATION LINE: V

Solution 2 **not on the final List**	**PLANT FOR INTEGRATING BIODIGESTION, GASIFICATION AND SOLAR TECHNOLOGIES FOR RECOVERING ENERGY.**
Product / service	
Technology	**X**

I. Basic information

Description of functions

What is the effect or final product?

Process plant that integrates the technologies of gasification, biodigestion and solar concentration that allows processing any type of organic waste (on a wet or dry basis) for the generation of biofuel that in turn can be used to generate heat and/or electrical energy in different sectors such as industrial, urban and agricultural.

Description of technology and TRL level (if applicable)

The process plant includes several pre-treatment systems, where the biomass is humidified to increase the efficiency of the process, as well as recirculations with a high bacteriological content to reduce process times. The solution is highly adaptable to different types of waste biomass and different generation capacities, depending on the specific needs that arise. The plant allows savings of up to 70% of the normal water consumption for the biodigestion process, as well as a 20% increase in biogas production and a 50% shorter time with better performance per biodigester volumetric unit.

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No information about TRL is provided. However, taking into account the description of the solution, it is considered a TRL 7-8.

Description of product/service and TRL level (if applicable)

Not applicable.

Basic conditions of use

Please include also minimum requirements of a given solution regarding the availability of public infrastructure.

No information provided.

Please include the optimal scale/size of investment at which their solution or technology makes economic sense

This integrated solution allows a 70% reduction of the water consumption and a 50% shorter time.

What kind of waste the solution is able to utilize or valorise?

Organic waste from agriculture, industry, or domestic sources.

To what extent does the use of a given solution or technology depend on climatic conditions?

This solution is not considered to be dependent on climatic conditions.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

Not relevant.

Solution owner and his willingness to provide detailed technical and technological data

4E POWER AND FUELS S. DE R.L.

Has the Life Cycle Analysis been already done for this solution?

No information provided.

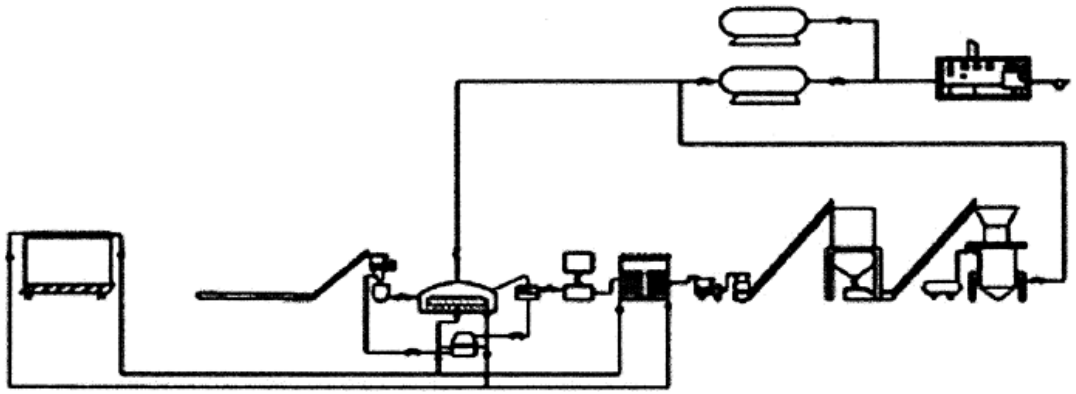
Source of data

Derwent Innovation patent search.

References

Please include a description and a photo of any examples of the implementation.

Layout of the process:



Source: Derwent Innovation patent search.

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The solution addresses the recover end-of-life stage as it turns waste into energy.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:

***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*

***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

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The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The solution addresses sustainability needs as it allows the treatment of organic waste and convert it into heat or electrical energy.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*
TYPICAL NON-FOOD ITEMS	
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.	
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.	
Medical supplies, wheelchairs, cold boxes.	
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).	
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.	
Paper, printed products, office equipment, electronic waste, etc.	
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.	

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

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Conceptualization and planning

.....

Procurement – sourcing/ purchasing of products and services

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Goods collection in warehouses and repacking for transport to final destination

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Custom clearance

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Transport to the destination country (often multi-stage and using different modes of transport)
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Transport to the final destinations – last mile
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Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
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3. RECOVER – processes for the bioremediation of plastic pollution in soils and compost and the biotransformation of conventional plastics into bio-fertilizers and biodegradable plastics for agricultural and food packaging applications.

Responsible partner: AIMPLAS
INVESTIGATION LINE: II

Solution 3 **not on the final List**	**RECOVER**
Product / service	
Technology	*X*
I. Basic information	
Description of functions *What is the effect or final product?* Novel biotechnological solutions that aim to solve the problem of accumulation of non-recyclable agricultural and packaging plastics and micro-plastics pollution. It will apply biotech solutions, including a combination of microorganisms, novel enzymes, earthworms, and insects to work collaboratively, not only to degrade plastics but also to transform them into added-value products.	
Description of technology and TRL level (if applicable) RECOVER will develop processes for the bioremediation of plastic pollution in soils and compost and the biotransformation of conventional plastics into bio-fertilizers and biodegradable plastics for agricultural and food packaging applications. The innovation consists on the combination of endogenous and exogenous microorganisms their inoculation on insects. The TRL is different depending on the process. For example, the TRL related to plastic remediation in soil with earthworms is currently between 4 and 5, with scaling-up efforts developed at UMH facilities. In the RECOVER project, they work with several scales in the lab (ranging from 200g to 1 kg). Upscaling to efficient processes must be achieved at least to 500 L containers (250 kg fresh weight batches). The use of larger treatment batches reduces the control capacity of bioremediation.	
Description of product/service and TRL level (if applicable)	

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- Enzymes and biotech formulations for plastic recycling and removal
- Bioplastic formulation for application in agriculture, food packaging and coatings
- Biofertilizers from organic matter leftovers and treatments
- Progress in the use of the by products from the process (chitin, chitosan and organic leftovers) for the production of agricultural and packaging items and bio fertilizers.

The TRL of biofertilizers production is 8-9.

.....

Basic conditions of use

Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense

The project is still on a study phase level, therefore, there is still no available infrastructure that could carry out the execution of breaking down the non-recyclable agricultural, packaging plastics and micro-plastics pollution.

Considering that the TRL achieved is between TRL 8-9, the cost of implementing a small facility for local communities could range from 100K to 300K, depending on the treatment capacities. With this investment per plant, the estimated treatment capacity would be around 500-1000 tons of fresh weight plastic-polluted organic waste per year.

What kind of waste the solution is able to utilize or valorise?

The proposed solution is able to valorise non-recyclable agricultural and packaging plastics and micro-plastics pollution into bio-fertilizers and biodegradable plastics for agricultural and food packaging applications.

To what extent does the use of a given solution or technology depend on climatic conditions?

Information about climate conditions is nor provided.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

At the moment, the solution does not propose an autonomous or mobile unit.

Solution owner and his willingness to provide detailed technical and technological data

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Has the Life Cycle Analysis been already done for this solution?

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Source of data

https://recover-bbi.eu/

References

Please include a description and a photo of any examples of the implementation.

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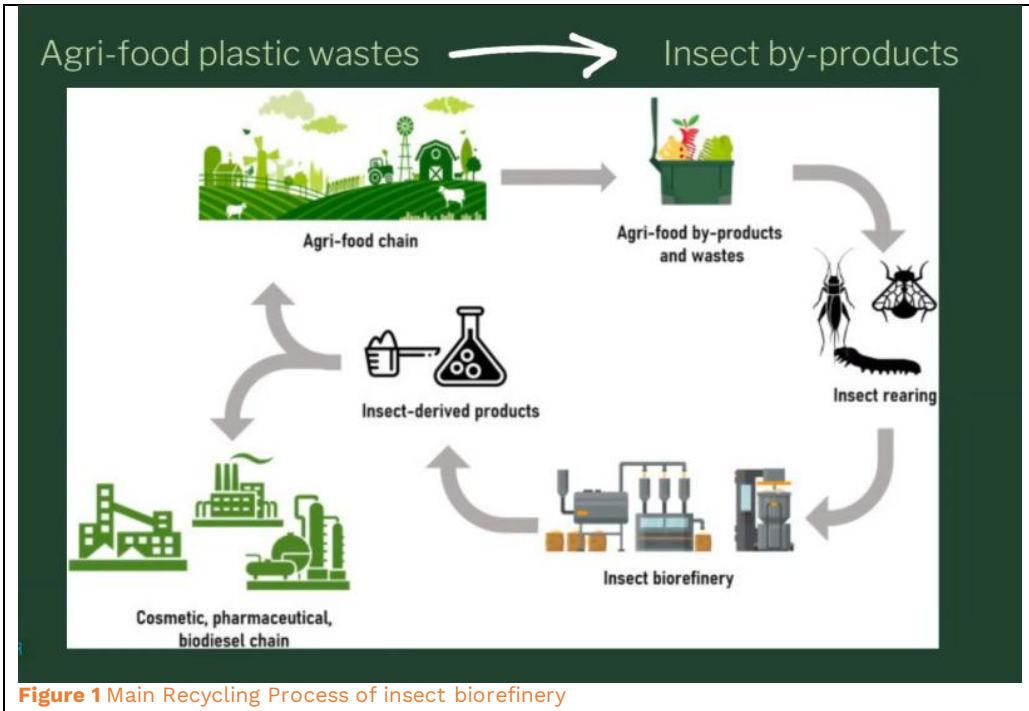

Figure 1 Main Recycling Process of insect biorefinery

Source: the web page of the RECOVER project

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The project aims to reduce the accumulation of non-recyclable agricultural, packaging plastics and microplastics. By implementing new compostable and biodegradable transformations including a combination of microorganisms, novel enzymes, earthworms, and insects to work collaboratively, the output consists in bio-fertilizers and biodegradable plastics for agricultural and food packaging applications.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The application of this solution is still in an early phase even though there have been key successes such as the development of a device for microplastic monitoring, biodegradable plant pots, fertilisers, and food packaging film. 'All these products are moving towards commercialisation,' remarks López. 'Eliminating plastic from the soil, however, proved more challenging.'. Nevertheless, the expected outcome could potentially reduce

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humanitarian waste and be used in future food packaging and other interesting applications for humanitarian aid.

The adoption of 500L container solutions could be feasible for small local communities, where bioremediation can be carried out easily using circular economy principles. This approach helps avoid large centralized plants, where transportation and storage could become bottlenecks for sustainability.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

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Conceptualization and planning

……

Procurement – sourcing/ purchasing of products and services

The end products from the recycled waste can be used in packaging of products. Which could conform humanitarian aid goods in the future.

Goods collection in warehouses and repacking for transport to final destination

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Custom clearance

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Transport to the destination country (often multi-stage and using different modes of transport)

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Transport to the final destinations – last mile

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Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
It would be useful by the end of the humanitarian supply chain by reducing the waste products and recover local soils (biofertilizers and bioremediation of plastic accumulation). However, the planification of how this solution could be applied in the field is not provided.

4. LUCRA – cutting-edge thermal and enzymatic technologies, fermentation processes and revolutionary electrochemical methods.

Responsible partner: AIMPLAS
INVESTIGATION LINE: II

Solution 4 **not on the final List**	**LUCRA**
Product / service	
Technology	X

I. Basic information

Description of functions
What is the effect or final product?

Demonstrating the technical and economic feasibility of turning organic waste into bio-succinic acid in a pre-industrial scale, holding the innovation across packaging, personal care, food & beverage, textiles, agriculture and automotive.

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Description of technology and TRL level (if applicable)

Cutting-edge thermal and enzymatic technologies, fermentation processes and revolutionary electrochemical methods. TRL 4.

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Description of product/service and TRL level (if applicable)

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Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense.

Medium investment but worth because it uses solid and wood wastes to produce bio-succinic acid. The resources are accessible from the final destination.

What kind of waste the solution is able to utilize or valorise?

Organic solid waste and wood waste.

To what extent does the use of a given solution or technology depend on climatic conditions?

The mentioned technology is not affected by climatic conditions.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

It is not possible to refine the solution as an autonomous and mobile unit.

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Solution owner and his willingness to provide detailed technical and technological data

Public information about the project is published on the website: **https://lucra-project.eu/**

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Has the Life Cycle Analysis been already done for this solution?

LCA is planned. No more information.

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Source of data

https://lucra-project.eu/project/our-concept/

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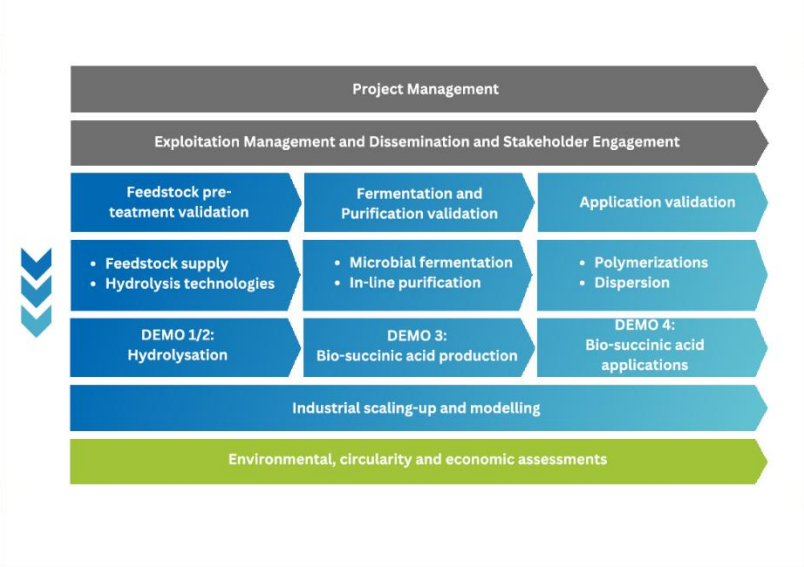
References

Please include a description and a photo of any examples of the implementation.



II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

Recycling and valorization of solid wastes and wood wastes by innovative hydrolysis methods to release carbohydrates from the waste and ferment them for the extraction of bio-succinic acid.

.....

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Funded by the European Union

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Please describe below how the solutions addresses the needs.

Circular utilization of solid wastes reduces the cost of bio-succinic acid and the dependence on fossil-based resources.

The production of bio-succinic acid also reduces the greenhouse gas emissions compared with succinic acid conventional production.

Allow production at full industrial capacity.

.....

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

.....

Conceptualization and planning

.....

Procurement – sourcing/ purchasing of products and services

.....

Goods collection in warehouses and repacking for transport to final destination

.....

Custom clearance

.....

Transport to the destination country (often multi-stage and using different modes of transport)

.....

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Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
Create a useful network to transport wastes generated in the final stages of the supply chain to produce bio-succinic acid. Logistics to the industrial site have to be considered too. .....

5. Production of green plastics from organic waste by fermentation technology in bioreactors.

Responsible partner: UNIVERSIDAD DE CANTABRIA
INVESTIGATION LINE: additional entry

Solution 5 **not on the final List**	**Production of green plastics (e.g., PHAs) from organic waste by fermentation technology in bioreactors**
Product / service	*X*
Technology	**X**
I. Basic information	
Description of functions *What is the effect or final product?* The final product is bioplastics.	
Description of technology and TRL level (if applicable) This technology is basically consisting of: ▯ Bioreactor: A controlled vessel where microbial fermentation occurs, maintaining optimal conditions such as pH, temperature, and oxygen levels. ▯ Microorganisms: Specialized bacteria or fungi capable of synthesizing biopolymers from carbon sources in organic waste. ▯ Sensors and Controllers: Devices to monitor parameters like pH, temperature, dissolved oxygen, and nutrient levels to ensure efficient fermentation. In this diagram explain a two-step PHA production process: first organic waste converted into volatile fatty acids (VFA) utilizing Mixed Microbial Communities (MMC) fermentation, then produced VFA converted into PHA using PHA accumulating microbes.	

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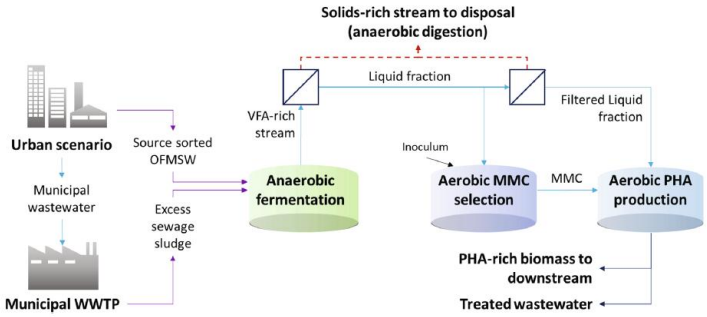

For most applications, TRL 5 to TRL 7 is where this technology typically resides. The production of PHA in microbes is a complex process and affected by nutrient and environmental factors. Various factors affect PHA production such as Carbone source, nitrogen and phosphate source and also dissolved oxygen and agitation.

The downstream of PHAs process

The extraction and purification of Polyhydroxyalkanoates (PHAs) from microbial biomass are crucial for maintaining product quality and controlling production costs. After PHA production, biomass is separated from the fermentation broth using methods like sedimentation, centrifugation, or flocculation. The choice of extraction method depends on factors such as microbial strain, PHA type, and application.

Key Steps in PHA Extraction:

1. ***Biomass Drying:*** Essential pretreatment using methods like thermal drying, lyophilization, or microwave drying. Microwave drying is noted for energy efficiency.
2. ***Cell Disruption Techniques:***
   Mechanical methods: High-pressure homogenization, ultrasonic digestion, bead mills.
   Chemical methods: Sodium hypochlorite and sodium hydroxide for cell lysis.
3. **Extraction Methods:**
   Solvent Extraction: Use of halogenated solvents (chloroform, dichloromethane) and non-halogenated solvents (acetone, ethanol, butyl acetate) for high recovery and purity.
   Supercritical Fluids: Supercritical CO_2 is effective due to its low toxicity and cost.
   Enzymatic Extraction: Energy-efficient and mild, with commercial enzymes achieving up to 93% recovery and 95% purity.

4. **Solvent Management:**
   Environmental concerns arise from solvent disposal, making solvent recycling essential but costly.

Efficiency:

Different solvents yield varying recovery rates, with butyl acetate achieving 96% recovery and 99% purity. Supercritical CO_2 and enzymatic methods offer eco-friendly alternatives.

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Description of product/service and TRL level (if applicable)

Green plastics exhibit essential properties such as biodegradability, non-toxicity, biocompatibility, thermoplasticity, piezoelectricity, and water insolubility. These characteristics underscore their significant potential to serve as sustainable alternatives to conventional petroplastics.

Basic conditions of use

Please include also minimum requirements of a given solution regarding the availability of public infrastructure.

For the production of green plastics from waste using fermentation technology in bioreactors, the minimum requirements regarding public infrastructure typically include the following:

- Waste Collection and Management Systems
- Utilities and Energy Supply
- Transportation and Logistics
- Industrial Zoning and Permits
- Workforce and Expertise
- Data and Monitoring Systems

Please include the optimal scale/size of investment at which their solution or technology makes economic sense

For the production of green plastics from waste via fermentation in bioreactors, the optimal scale depends on factors such as feedstock availability, technology maturity, and market demand. But to give an idea for **A Pilot/Demonstration-Scale Plant the investment is about 5 to 20 millions dollars**.

What kind of waste the solution is able to utilize or valorise?

Different type of feedstock for PHAs production such as agro-industry, oily wates, food waste, dairy industry waste, municipal waste and waste syngas.

To what extent does the use of a given solution or technology depend on climatic conditions?

Yes, climate conditions can significantly affect the fermentation process in a bioreactor for municipal solid waste (MSW) treatment. Factors such as temperature, humidity, and seasonal variations play a critical role in microbial activity, reaction rates, and overall efficiency of the fermentation process.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

.....

Solution owner and his willingness to provide detailed technical and technological data

.....

Has the Life Cycle Analysis been already done for this solution?

Yes, Life Cycle Analysis (LCA) has been conducted for various solutions involving the production of green plastics through fermentation in bioreactors. LCAs evaluate the environmental impact of the entire production process, from raw material sourcing (waste feedstocks) to the final product, including energy use, emissions, and waste management.

- Life Cycle Assessment (LCA) of Bioplastics Production from Lignocellulosic Waste (Study Case: PLA and PHB)
- Prospective LCA to provide environmental guidance for developing waste-to-PHA biorefineries

Source of data

Colombo, B.; Favini, F.; Scaglia, B.; Sciarria, T.P.; D'Imporzano, G.; Pognani, M.; Alekseeva, A.; Eisele, G.; Cosentino, C.; Adani, F.; 2017. Enhanced

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polyhydroxyalkanoate (PHA) production from the organic fraction of municipal solid waste by using mixed microbial culture. Biotechnol. Biofuels 10, 201.

Bhatia, S. K.; Otari, S. V.; Jeon, J.-M.; Gurav, R.; Choi, Y.-K.; Bhatia, R. K.; Pugazhendhi, A.; Kumar, V.; Banu, J. R.; Yoon, J.-J.; Choi, K.-Y.; Yang, Y.-H.;2021. Biowaste-to-bioplastic (polyhydroxyalkanoates): Conversion technologies, strategies, challenges, and perspective.

Kuang, Z.-Y.; Yang, H.; Shen, S.-W.; Lin, Y.-N.; Sun, S.-W.; Neureiter, M.; Yue, H.-T.; Ye, J.-W.; 2023. Bio-conversion of organic wastes towards polyhydroxyalkanoates, Biotechnology Notes, V (4), Pages 118-126.

Aramvash, A., Gholami-Banadkuki, N., Moazzeni-Zavareh, F., Hajizadeh-Turchi, S., 2015. An environmentally friendly and efficient method for extraction of PHB biopolymer with non-halogenated solvents. J. Microbiol. Biotechnol. 25, 1936–1943.
Saavedra del Oso, M.; Mauricio-Iglesias, M.; Almudena Hospido; Bernhard Steubing; 2023. Prospective LCA to provide environmental guidance for developing waste-to-PHA biorefineries, Journal of Cleaner Production. 383. 135331.

References

Please include a description and a photo of any examples of the implementation.

PHA production via fermentation in bioreactors has reached a commercial level, and there are several operational plants worldwide. However, it is still an emerging industry compared to more established plastics, largely due to production costs and scalability challenges. Example of the plants such as: Danimer Scientific (USA), TianAn Biologic (China) and more.

Municipal Solid Waste (MSW) as Feedstock, PHA production using MSW is an area of growing interest. Companies and research initiatives are exploring the use of organic waste fractions to reduce costs and enhance sustainability. Some pilot plants and smaller operations are testing this approach, but large-scale adoption is still developing.

Challenges to Commercialization:

- High Production Costs: Compared to petrochemical plastics, PHA production is more expensive due to fermentation and downstream processing costs (as membrane technologies, for instance).
- Feedstock Availability: Consistent and cost-effective feedstock (e.g., MSW or agricultural waste) is critical.
- Scale-Up Challenges: Scaling from lab to industrial-scale bioreactors involves technological and logistical hurdles.
- Market Demand: Growing interest in sustainable plastics is driving demand, but the market is still maturing.

.....

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

This solution refers to the 4R principle (Reduce, Reuse, Recycle, Recover) for managing organic solid waste and targets the conversion of this waste into biodegradable plastics like polyhydroxyalkanoates (PHAs).

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III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
1) bio - based products / services *in order to diminish the amounts of waste generated by humanitarian interventions*
2) bio - based technologies *in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

One part of the waste generated by the humanitarian sector is organic solid waste. In order to mitigate this, it can be utilized as a source for eco-friendly products that not only reduce waste but also create value-added products.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Organic solid wastes can be generated at any stage of the supply chain, but the largest amount is typically produced during the final stage to reduce emission to air, water and soil.

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The consideration of the type of waste to be recycled may be influenced by the needs of the humanitarian actor and the affect the operating conditions of the the solution implemented.
Identification of needs
X
Conceptualization and planning
.....
Procurement – sourcing/ purchasing of products and services
.....
Goods collection in warehouses and repacking for transport to final destination
X
Custom clearance
X.....
Transport to the destination country (often multi-stage and using different modes of transport)
X.....
Transport to the final destinations – last mile
X.....
Storage at the final destination
X.....
Operational logistic at final destination - distribution of goods and services
This stage is critical from a waste generation perspective. In this regard, this solution is more sustainable and can also incorporate organic solid waste from other local sources.

6. PHENOLEXA – benign, efficient, and environmentally friendly biorefinery process, focusing on specific agricultural waste

Responsible partner: AIMPLAS
INVESTIGATION LINE: II

Solution 6 **not on the final List**	**PHENOLEXA**
Product / service	
Technology	X
I. Basic information	
Description of functions *What is the effect or final product?*	

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Developing a benign, efficient, and environmentally friendly biorefinery process, focusing on specific agricultural waste streams. The process consists in extracting and refining polyphenols from those waste streams mentioned.

Developing a novel biological and physical feedstock pre-treatment using novel green solvents, subcritical water, maximizing efficiency and preserving the desired qualities of the polyphenols.

Using the technology in pharmaceutical, nutraceutical and cosmeceutical products.

.....

Description of technology and TRL level (if applicable)

The technology for the biorefinery starts in a lab-scale level. TRL 3.

The objective is upscaling the technologies at TRL 4-5.

.....

Description of product/service and TRL level (if applicable)

Demonstration of consumer products prototypes at laboratory scale for different applications:

- Pharmaceutical. TRL 3.
- Nutraceutical. TRL 3.
- Cosmoceutical. TRL 3.

.....

Basic conditions of use

Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense

The biorefinery process aims for a high scale of investment as it requires an industrial site to develop the activities related with it, and also build the entire logistics network.

What kind of waste the solution is able to utilize or valorise?

The biorefinery processes obtains substances from residues as onion skins and peels, vine leaves and branches, olive leaves and branches, and chicory roots and leaves.

To what extent does the use of a given solution or technology depend on climatic conditions?

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Climatic conditions do not affect to the process.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

There is no possibility to use the technology as an autonomous and mobile unit.

.....

Solution owner and his willingness to provide detailed technical and technological data

Information material is accessible and published at the project's website: **http://phenolexa.eu/results-and-resources**

.....

Has the Life Cycle Analysis been already done for this solution?

LCA in a part of the project. No more information found.

.....

Source of data

http://phenolexa.eu/

.....

References

Please include a description and a photo of any examples of the implementation.

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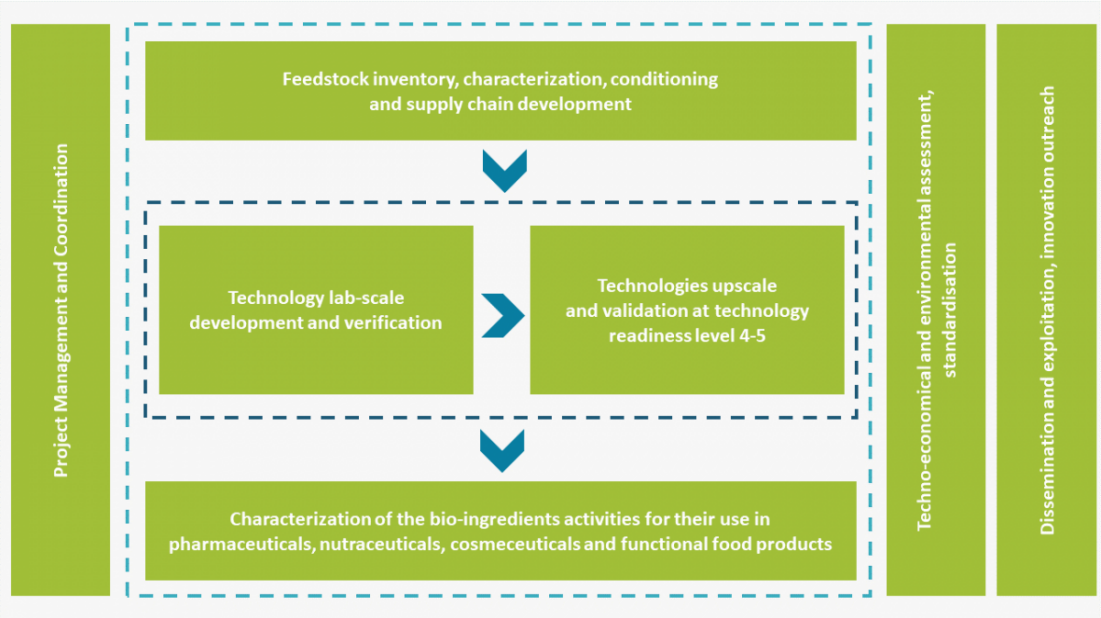

Project structure.

.....

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The environmental objective is to avoid the greenhouse gas emissions that come from burning biomass by diverting the feedstocks for higher-value products that can be reintroduced into the market.

.....

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:

1) bio - based products / services *in order to diminish the amounts of waste generated by humanitarian interventions*

2) bio - based technologies *in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:

· *ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;*

· *sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;*

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· *utilization of local resources and knowledge.*

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The biorefinery process reduces the environmental impact of pharmaceutical, nutraceutical, and cosmeceutical products by using agricultural waste streams for the process.

The main contribution is reducing the number of products sent to incineration or landfill, that is also a source of GHGs.

In a society perspective, it helps to develop ingredients for cosmeceuticals, neutraceuticals, prebiotics and functional foods and drinks, reinforcing the concept of zero waste by relying on natural, rather than synthetic sources.

.....

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.

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Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.
Please indicate the link of the supply chain for which the solution can be applied? Describe how.
Identification of needs
.....
Conceptualization and planning
Planning a network that takes benefit of the agricultural waste from a specific zone (or various zones) to bring circularity to the supply chain. .....
Procurement – sourcing/ purchasing of products and services
Extend the concept of using natural materials instead of synthetic, beginning with the purchase of these bio-based products, that directly reduces the environmental impact of the supply chain. .....
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
Reverse logistics from places in the destination that have agrifood wasted than can be used for the biorefinery feedstocks. .....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
.....

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7. Waste conversion technology.

Responsible partner: ITENE
INVESTIGATION LINE: I

Solution 7 **not on the final List**	**Waste conversion technology**
Product / service	
Technology	X

I. Basic information

Description of functions
What is the effect or final product?
Waste conversion technology that can be used in humanitarian applications.

Description of technology and TRL level (if applicable)
TRL 7-8 (prototype demonstration)

Description of product/service and TRL level (if applicable)
NA

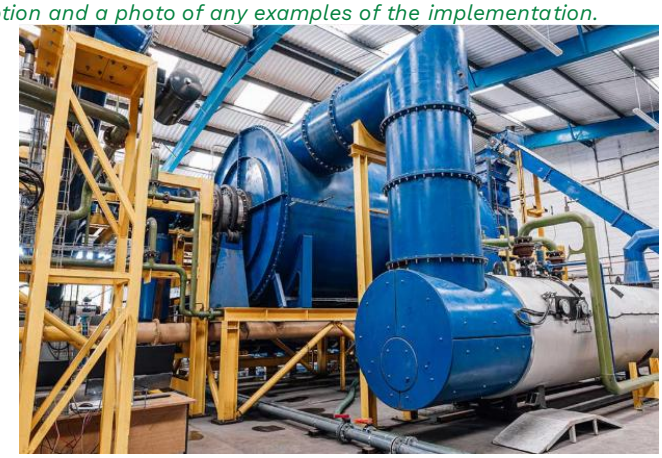
Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure.
Please include the optimal scale/size of investment at which their solution or technology makes economic sense
It depends upon scale and integration into a specific application, ranges from €0.5Million to €10Million+.
What kind of waste the solution is able to utilize or valorise?
Solid urban biowaste (e.g. household organic waste).
To what extent does the use of a given solution or technology depend on climatic conditions?
It is affected by moisture levels and quality of the feedstock.
Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)
Under study.

Solution owner and his willingness to provide detailed technical and technological data
Premier Green Energy, willing to provide further information.

Has the Life Cycle Analysis been already done for this solution?
Yes, confidential information.

Source of data
Response to online survey on December 2nd.

References
Please include a description and a photo of any examples of the implementation.



Fully patented PRIMA waste to energy technology

The gas cracking technology and advanced thermal treatment process (PRIMA 3000) decomposes feedstock (waste) with no oxygen present in the reaction chamber. The process reduces CO2 and harmful GHG emissions and maximises the Green Tech Energy produced from the feedstock 5 times more than the incineration process.

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PRIMA 3000 deliver three key outputs:
SynGas - high quality clean synthetic gas (syngas) can be used as fuel in gas engines or furnace applications to displace natural gas.
Carbon Char - residue collected from the advanced thermal treatment process, locking carbon in its solid form and used as sequestered products in the construction and aggregates sectors.
Recovered Heat - the process produces significant quantities of recovered heat in the form of steam or hot water, all of which can be used to displace industrial processes or building heating where required.

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.
Recover energy (for a technology solution).

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.
The waste to energy low carbon technology solutions create net zero carbon renewable energy helping mitigate $C0_2$ emissions and reduce the reliance on fossil.

IV. Logistic supply chains application potential - in which stage?

***The 'humanitarian supply chain'** is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*
TYPICAL NON-FOOD ITEMS	
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.	
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.	
Medical supplies, wheelchairs, cold boxes.	
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).	
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.	

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Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.
Please indicate the link of the supply chain for which the solution can be applied? Describe how.
Identification of needs
.....
Conceptualization and planning
.....
Procurement – sourcing/ purchasing of products and services
.....
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
.....

8. CIRCULAR BIOCARBON - multi-site biorefinery recovering organic matter of the organic fraction of municipal solid waste and sewage sludge.

Responsible partner: AIMPLAS
INVESTIGATION LINE: II

Solution 8 **not on the final List**	**CIRCULAR BIOCARBON**
Product / service	
Technology	
I. Basic information	
Description of functions *What is the effect or final product?*	

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Biorefinery will move beyond traditional waste treatment processes to turn the bio-waste produced in the city into valuable sources of building blocks and intermediates. The goal is to obtain high-added-value end products based on green bio-based materials, local sustainable feedstock and circular production processes.

.....

Description of technology and TRL level (if applicable)

TRL (6-7) Multi-site biorefinery which will recover organic matter of the Organic Fraction of Municipal Solid Waste and Sewage sludge(OFMSW and SS). It will use cascading technologies - from anaerobic process steps (after proper pre-treatment) of mixed urban waste streams - in order to treat all the bio-waste produced by a medium-sized city. At the end of the project, a commercial-scale biorefinery will be in full operation.

.....

Description of product/service and TRL level (if applicable)

TRL (6-7) The pioneer biorefinery will turn urban waste streams generated in cities into products for industries and end-consumers, including coating of direct consumer products, coating of mechanical moving parts, coating of plastic moulding tools, compostable waste bags, green graphene-based devices, biodegradable soil mulch films, solid organomineral fertiliser with biostimulant properties and liquid biobased biostimulant.
As a result, the progressive transformation of city waste treatment plants into biorefineries will be observed, generating new income streams from collecting, managing and treating city waste. Additionally, business opportunities for stakeholders and actors in the bio-based sectors will be increased.

.....

Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense

The innovative solution studied requires a high budget to make it feasible. Since it implies the integration of new management systems of urban waste in a highly prepared refinery. This project was subsidized with 23 M€.

What kind of waste the solution is able to utilize or valorise?

The solution will be able to valorise the waste streams of a medium-sized city. At the moment, the solution is operating two biorefineries, one in Spain (Zaragoza) and another one in Italy (Sesto San Giovanni) at a demonstration level. Nevertheless, the aim is to operate fully at a commercial level by the end of the project (5 years total).

To what extent does the use of a given solution or technology depend on climatic conditions?
Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

Regarding the influence of climatic conditions, this infrastructure would not be necessarily affected by it. Lastly, this solution could not be used as an autonomous mobile unit.

.....

Solution owner and his willingness to provide detailed technical and technological data

.....

Has the Life Cycle Analysis been already done for this solution?

.....

Source of data

https://circularbiocarbon.eu/about/project

References
Please include a description and a photo of any examples of the implementation.

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Figure 2 Zaragoza´s Biorefinery

Figure 3 Sesto San Giovanni refinery project

https://circularbiocarbon.eu/about/project

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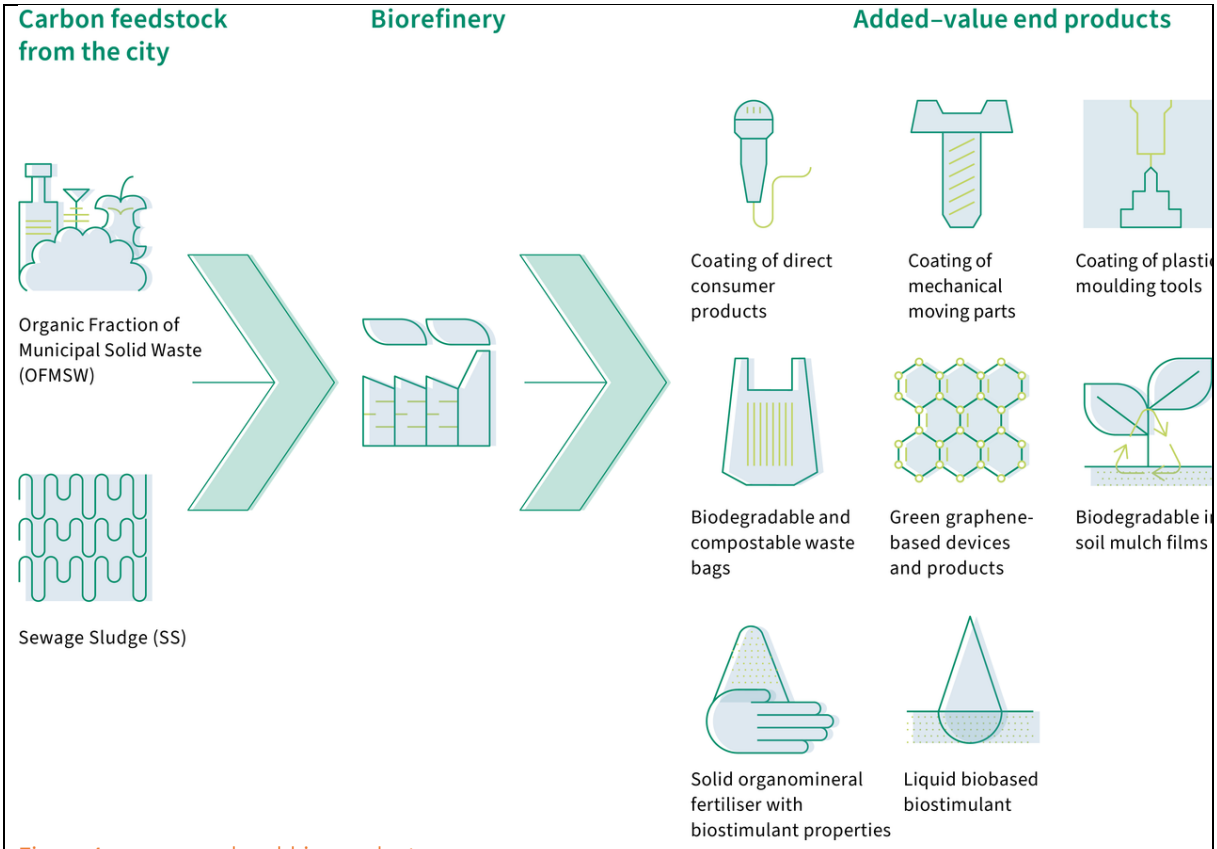

Figure 4 process and end bio-products

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The project aims to reduce biowaste and to reuse it into new recycled and recovered products. Therefore, biodegradability and other processes in order to generate products are needed. It also focuses on setting the basis for a new circular way of waste treatment within the cities.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
- *ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;*
- *sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;*
- *utilization of local resources and knowledge.*

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The application of this solution could be segregated into two main lines. The creation of a biorefinery that would contain technologies that would facilitate the reduction of organic waste in localities, offering bio-based

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products. Or the procurement of goods for humanitarian aid derived from results of the biorefinery recycling process. However, for the first option an elevated budget of infrastructure would be needed and for the last option, it would be necessary to study whether there are companies that use this raw material to sell consumer products useful in humanitarian aid.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*
TYPICAL NON-FOOD ITEMS	
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.	
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.	
Medical supplies, wheelchairs, cold boxes.	
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).	
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.	
Paper, printed products, office equipment, electronic waste, etc.	
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.	

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

.....

Conceptualization and planning

.....

Procurement – sourcing/ purchasing of products and services

The end products of the Spanish and Italian Biorefineries can be used in the packaging of products. Which could conform humanitarian aid goods in the future.

Goods collection in warehouses and repacking for transport to final destination

.....

Custom clearance

.....

Transport to the destination country (often multi-stage and using different modes of transport)

.....

Transport to the final destinations – last mile

.....

Storage at the final destination

.....

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Operational logistic at final destination - distribution of goods and services
It would be useful by the end of the humanitarian supply chain by reducing the organic waste products and sewage sludge produced. However, this solution is planned as a fixed infrastructure that helps medium-sized cities.

9. ENZYCLE – enzymatic recycling technology

Responsible partners: ITENE & AIMPLAS
INVESTIGATION LINE: I and II

Solution 9 **not on the final List**	**Enzymatic recycling technology (ENZYCLE)**
Product / service	
Technology	X

I. Basic information

Description of functions
What is the effect or final product?
Enzymatic recycling allows materials (polymers) to be broken down into reusable compounds. In the case of the ENZYCLE project, newly developed enzymes were able to depolymerise PET into terephthalic acid (TA) and ethylene glycol. TA was recovered and further processed to produce new materials (e.g. PET pellets, PET yoghurt lids, cups and trays) and to partially replace virgin materials in other applications (insulation foams). In the case of multi-layer materials such as PET-PE, the enzymatic degradation of PET also allows the mechanical recycling of PE into flexible films.

Description of technology and TRL level (if applicable)
TRL = 5

Description of product/service and TRL level (if applicable)

Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure.
Sorting of plastics.
Please include the optimal scale/size of investment at which their solution or technology makes economic sense
This is an innovative technology that is still under development. The cost of enzymes and purification processes makes it more expensive than other types of recycling.
What kind of waste the solution is able to utilize or valorise?
Monolayer (PET) and multilayer packaging materials (PET-PE).
To what extent does the use of a given solution or technology depend on climatic conditions?
It does not depend.
Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)
A filter for recovering microplastics from wastewater was under development at lab scale.
.....

Solution owner and his willingness to provide detailed technical and technological data
Enzycle (https://www.cbe.europa.eu/projects/enzycle)

Has the Life Cycle Analysis been already done for this solution?
Yes.

Source of data
ITENE as coordinator of the ENZYCLE project.

References
Please include a description and a photo of any examples of the implementation.

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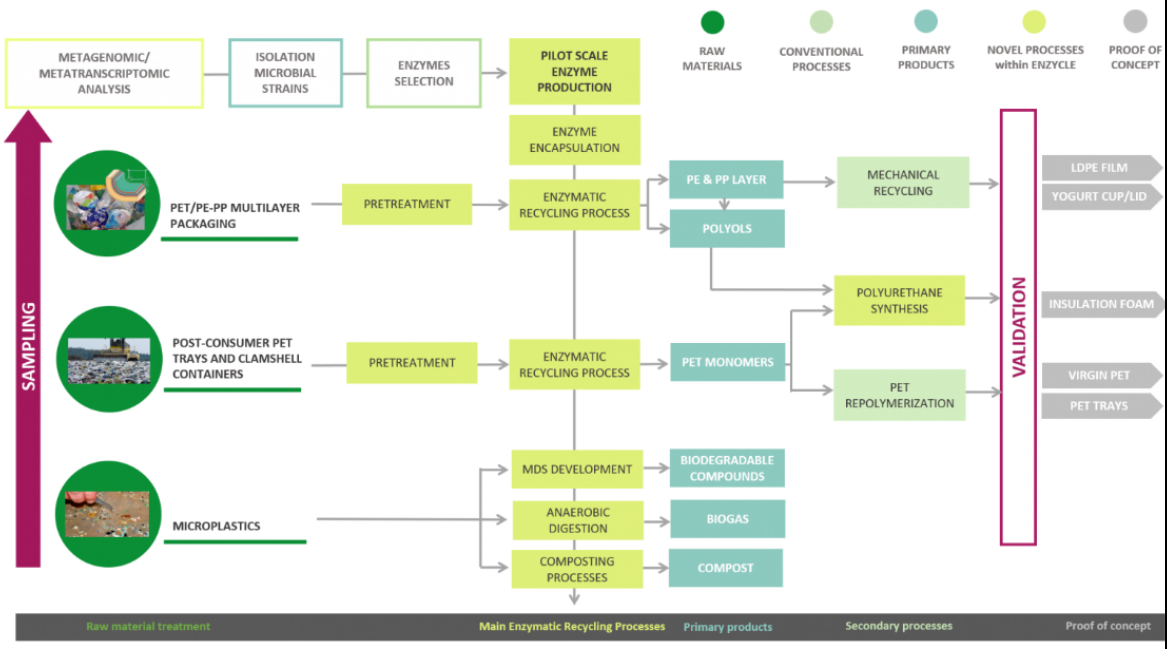
Main Enzymatic Recycling Process:



https://www.cbe.europa.eu/projects/enzycle

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.
Recycling of PET materials into same or different applications.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.
Recover of plastic materials.

IV. Logistic supply chains application potential - in which stage?

***The 'humanitarian supply chain'** is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

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COMMODITY TYPE	PACKAGING
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs
.....
Conceptualization and planning
.....
Procurement – sourcing/ purchasing of products and services
.....
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
.....

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10. Method for producing biofuel

Responsible partners: ITENE
INVESTIGATION LINE: V

Solution 10 **not on the final List**	**METHOD FOR PRODUCING BIOFUEL**
Product / service	
Technology	**X**

I. Basic information

Description of functions

What is the effect or final product?

The present invention provides a production method for biofuel based on a technology to convert carbon-dioxide as a carbon source through photosynthesis by photosynthetic microorganisms to biomass and produce biofuel of the biomass.

Description of technology and TRL level (if applicable)

The production method for biofuel of the present invention comprises a culturing process (S1) of culturing in a culture solution photosynthetic microorganisms which store oils, fats and carbohydrates in cells of the photosynthetic microorganisms, an oil and fat conversion process (S2) of converting the carbohydrates stored in the cells of the photosynthetic microorganisms cultured in the culture apparatus to oils and fats, an extraction process (S3) of extracting the oils and fats out of the cells of the photosynthetic microorganisms, and a reforming process (S4) to reform the extracted oils and fats.

No information about TRL is provided.

Description of product/service and TRL level (if applicable)

Not applicable.

Basic conditions of use

Please include also minimum requirements of a given solution regarding the availability of public infrastructure.

No information provided.

Please include the optimal scale/size of investment at which their solution or technology makes economic sense

No information provided.

What kind of waste the solution is able to utilize or valorise?

Biomass, not specified.

To what extent does the use of a given solution or technology depend on climatic conditions?

No relevant information is provided.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

Not relevant.

Solution owner and his willingness to provide detailed technical and technological data

JX Nippon Oil & Energy Corporation.

Has the Life Cycle Analysis been already done for this solution?

No information provided.

Source of data

Derwent Innovation patent search.

References

Please include a description and a photo of any examples of the implementation.

Block diagram of the process:

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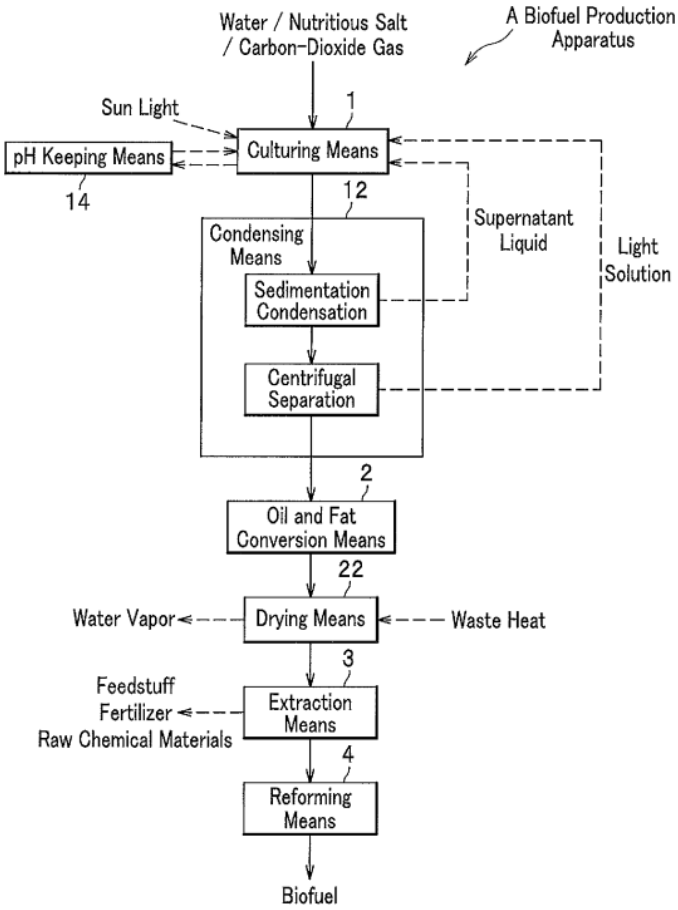

Source: Derwent Innovation patent search.

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The solution addresses the recover end-of-life stage as it turns biomass into fuel.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The solution addresses sustainability needs as it allows the treatment of biomass to convert it into fuel.

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IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*
TYPICAL NON-FOOD ITEMS	
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.	
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.	
Medical supplies, wheelchairs, cold boxes.	
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).	
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.	
Paper, printed products, office equipment, electronic waste, etc.	
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.	

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs
.....
Conceptualization and planning
.....
Procurement – sourcing/ purchasing of products and services
.....
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
.....

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11. REDYSIGN – technological processes focused on efficiency in the use of energy, water and chemical resources for the production of easily recyclable wood-based packaging materials.

Responsible partners: AIMPLAS
INVESTIGATION LINE: II

Solution 11 **not on the final List**	**REDYSIGN**
Product / service	X
Technology	

I. Basic information

Description of functions
What is the effect or final product?
Redysign, focuses on the redesign of commonly used fossil origin packaging products (such as fresh food packaging) to transform them into 100% recyclable cellulosic packaging. In addition, it integrates new technologies that provide the packaging with the ability to indicate the state of conservation of the product and maintenance of the cold chain.

Description of technology and TRL level (if applicable)

(TRL 3-6) The project will develop 12 technological processes focused on efficiency in the use of energy, water and chemical resources for the production of easily recyclable wood-based packaging materials. They are now on their second year of development.

.....

Description of product/service and TRL level (if applicable)

(TRL 0 -4) REDYSIGN will undertake the development of a new biobased, intelligent, and recyclable packaging for fresh meat that can replace current plastic packaging.

Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense

For this innovative project there is still some investigation to go through in order to obtain a results and therefore to plan an available public infrastructure and its budget.

What kind of waste the solution is able to utilize or valorise?

The solution aims to reduce plastic waste by replacing fossil origin packaging with fibre and sugar based ones. Which will be composed of 98% of wood by-products.

To what extent does the use of a given solution or technology depend on climatic conditions?

Information about climate conditions variability of the project is not provided.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

This solution could not be proposed as a mobile and autonomous unit.

Funded by the European Union

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Solution owner and his willingness to provide detailed technical and technological data

.....

Has the Life Cycle Analysis been already done for this solution?

.....

Source of data

https://www.tecnalia.com/noticias/envases-biobasados-reciclables-inteligentes-carne-fresca

https://www.cbe.europa.eu/projects/redysign

https://www.fnmt.es/innovacion/redysign

References

Please include a description and a photo of any examples of the implementation.

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The impact is not only to reduce plastic waste and replace food packaging with other cellulosic origin packaging. This would integrate new waste, but in this case it would be easier to biodegrate by the end of its life stage.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

This project offers a bio-based product and bio-based tecnologies integrated in the meat food chain.
The impact is not only to reduce plastic waste and replace food packaging with other cellulosic origin packaging, but also, has other readings at a social and economic level. The project is integrated into the cellulosic packaging market, a market that is booming and will allow the creation of new industries and, therefore, the creation of new jobs. Furthermore, the development of this new packaging paradigm will create new opportunities, delving into this environmentally responsible market.

IV. Logistic supply chains application potential - in which stage?

***The 'humanitarian supply chain'** is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

Funded by the European Union

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COMMODITY TYPE	*PACKAGING*
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs
.....
Conceptualization and planning
Procurement – sourcing/ purchasing of products and services
In terms of the potential of the solution, it could be considered as an interesting source to buy humanitarian food aid since the packaging composition is an environmental asset
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services

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12. ELLIPSE – co-processing of organic wastes (sludge from the dairy industry and glycerol from the biodiesel industry) and recovering of nutrients to produce bio-based fertilizers.

Responsible partners: AIMPLAS
INVESTIGATION LINE: II

Solution 12 **not on the final List**	**ELLIPSE**
Product / service	X
Technology	

I. Basic information

Description of functions
What is the effect or final product?
Valorisation of paper and pulp sludge to produce PHAS for agricultural and personal care applications
.....

Description of technology and TRL level (if applicable)

TRL (0-4) coprocessing of organic wastes (OW) such as sludge from the dairy industry and glycerol from the biodiesel industry, as well as recovering nutrients to produce bio-based fertilizers (BBFs).
.....

Description of product/service and TRL level (if applicable)

TRL (0-4) ELLIPSE project will address the valorisation of two heterogeneous waste streams generated in significant amounts in Europe, slaughterhouse waste (bellygrass or rumen content) and paper and pulp sludge, to produce cost-efficient polyhydroxyalkanoates (PHAs) for agricultural and personal care applications.

.....

Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure.
Please include the optimal scale/size of investment at which their solution or technology makes economic sense
What kind of waste the solution is able to utilize or valorise?
To what extent does the use of a given solution or technology depend on climatic conditions?
Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

.....

Solution owner and his willingness to provide detailed technical and technological data
.....

Has the Life Cycle Analysis been already done for this solution?
.....

Source of data
https://ellipse-project.eu/#
https://www.cbe.europa.eu/projects/ellipse

References
Please include a description and a photo of any examples of the implementation.

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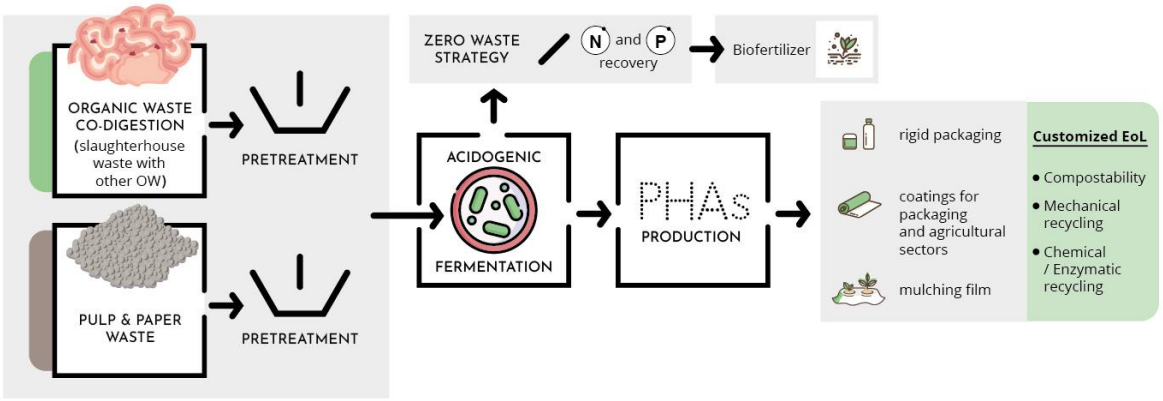
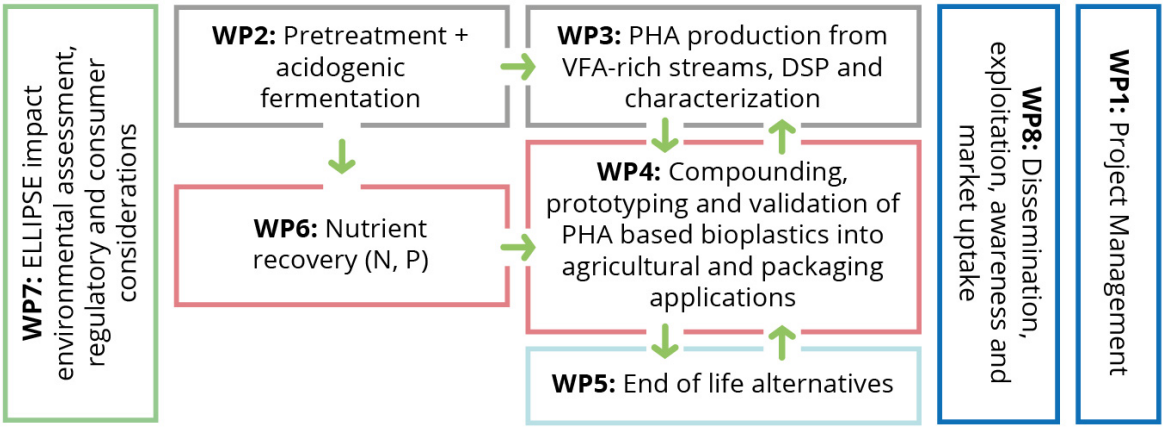


ELLIPSE approach for the production of PHA based cost-effective solutions and Zero-waste strategy contribution



ELLIPSE Pert chart

Rysunek 1 Ellypse Work Plan

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The integration of these waste streams as biorefinery feedstocks will allow reducing the volumes of landfilled waste, opening new avenues for platform chemicals and bioplastics production while creating additional revenue for the related industries generating them, with added advantages of water recycling, decreased soil degradation, groundwater pollution and methane emissions..

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

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The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The application of this solution could be segregated into two main lines. The creation of an infrastructure that would contain technologies that would facilitate the reduction of organic and paper waste in localities, Or the procurement of goods for humanitarian aid derived from results of the recycling process. However, for the first option an elevated budget of infrastructure would be needed and for the last option, it would be necessary to study whether there are companies that use this raw material to sell consumer products useful in humanitarian aid.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

.....

Conceptualization and planning

.....

Procurement – sourcing/ purchasing of products and services

The end products of solution can be used in the packaging of products. Which could conform humanitarian aid goods in the future.

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Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services
It would be useful by the end of the humanitarian supply chain by reducing the organic and pulp and paper waste. However the infrastructure needed for this is notable.

13. F-CUBED – hydrothermal conversion of biogenic residues

Responsible partners: ITENE
INVESTIGATION LINE: I

Solution 13 **not on the final List**	**Hydrothermal conversion of biogenic residues (F-CUBED)**
Product / service	-
Technology	X

I. Basic information

Description of functions
Hydrothermal conversion of a broad range of low quality biogenic residues to superior intermediate bioenergy carriers (IEC) with fuel characteristics suitable for balancing the power grid, and to produce transportation and heavy industry fuels.

Description of technology and TRL level (if applicable)
TRL = 5

Description of product/service and TRL level (if applicable)
-

Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure.
NA
Please include the optimal scale/size of investment at which their solution or technology makes economic sense.
The core process was experimentally validated using continuous hydrothermal reactor (20kg/hr) and dewatering pilots in a relevant industrial environment.

What kind of waste the solution can utilize or valorise?
Within the project, three types of biogenic residues were treated: paper sludge from cardboard production, fruit & vegetables processing wastes from baby food production

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and waste olive pomace from olive oil extraction. However, the F-CUBED process has been designed to meet the requirements of a feedstock flexible conversion technology.

To what extent does the use of a given solution or technology depend on climatic cconditions?
Temperature and humidity can affect the integrity of residues, which in turn can affect the heating requirements of the process.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)
Yes, modular and flexible solution that fits in industrial containers.

Solution owner and his willingness to provide detailed technical and technological data
TNO is the project coordinator. In the F-CUBED process, the hydrothermal treatment is executed via **TORWASH®** reactor technology. This is a patented TNO wet biomass treatment (WO2013162355).

Has the Life Cycle Analysis been already done for this solution?
Yes (D5.2)

Source of data
Project webpage

References
Please include a description and a photo of any examples of the implementation.

TORWASH® hydrothermal treatment of paper sludge

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.
F-CUBED goes beyond current thermochemical upgrading, through the integration of thermochemical biomass conversion with N-P-K recovery, liquid internal circulation anaerobic treatment and advanced dewatering of hydrothermal slurries.

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III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
1) bio - based products / services *in order to diminish the amounts of waste generated by humanitarian interventions*
2) bio - based technologies *in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

- *Please describe below how the solutions addresses the needs.*

The F-CUBED project offers a solution for organic residues that can be converted into energy and other valuable products. In order to treat and upgrade organic residues, a hydrothermal treatment, followed by filtration, produces a solid cake that can be pelletised for combustion and a liquid that can be used for nutrient recovery, oil and biogas production.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

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Conceptualization and planning
Procurement – sourcing/ purchasing of products and services
Goods collection in warehouses and repacking for transport to final destination
Custom clearance
Transport to the destination country (often multi-stage and using different modes of transport)
Transport to the final destinations – last mile
Storage at the final destination
Operational logistic at final destination - distribution of goods and services

14. CAFIPLA – pre-treatment cascade process converting biowaste streams into high-quality intermediates for the bio-based industry

Responsible partners: AIMPLAS
INVESTIGATION LINE: II

Solution 14 **not on the final List**	**CAFIPLA**
Product / service	**X**
Technology	
I. Basic information	
Description of functions *What is the effect or final product?* The CAFIPLA addresses the issue of heterogeneous biowaste and increases the supply of suitable feedstocks. It will develop and optimise a breakthrough pre-treatment cascade process that converts these biowaste streams into high-quality intermediates for the bio-based industry.	
Description of technology and TRL level (if applicable) (TRL 0 -4) The pre-treatment cascade process uses two conversion platforms; the first – the Carboxylic Acid Platform (CAP) - converts the easily degradable fraction into Short Chain Carboxylic Acids (SCCAs) and nutrients. The second - the Fibre Recovery Platform (FRP) - extracts insoluble lignocellulosic fibres from the remaining fraction. The residue is converted to biogas and compost. This will provide an economically viable and environmentally friendly treatment technology to create biowaste-based feedstock from a currently under-valorised biowaste.	

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……
Description of product/service and TRL level (if applicable) (TRL 0 -4) create biowaste-based feedstock from a currently under-valorised biowaste.
Basic conditions of use *Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense* This project continues previous investigation made in the development of Carboxylic acid platform (CAP) based on urban biowaste and culminating with the implementation of a Pilot Plant in the Netherlands. This research will focus on process control strategies to obtain specific spectra of carboxylic acids to feed into bioproduction of microbial protein, PHA or caproic acid bio-oil. *What kind of waste the solution is able to utilize or valorise?* In the FRP, fractionation into different fibre ranges will result in intermediates that can be valorised as packaging material or insulation. A pilot plant will further demonstrate the CAFIPLA upscaling potential. *To what extent does the use of a given solution or technology depend on climatic conditions?* Information about climate conditions variability of the project is not provided. *Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)* This solution could not be proposed as a mobile and autonomous unit.
Solution owner and his willingness to provide detailed technical and technological data ……
Has the Life Cycle Analysis been already done for this solution? ……
Source of data https://www.cbe.europa.eu/projects/cafipla https://dranco.be/lc_project/cafipla/
References *Please include a description and a photo of any examples of the implementation.*

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Schematic overview of CAFIPLA process

CAP: Carboxylic Acid Platform; FRP: Fibre Recovery Platform; SCCA: Short chain carboxylic acids; MCCA: Medium chain carboxylic acids; MP: Microbial protein; PHA: Polyhydroxyalkanoic acid.

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The project aims to provide added value to biogenic residues and waste materials. Therefore, its objective consists in the reduction of waste, and its recovery into useful by-products that can be used for different

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applications such as:

Short chain carboxylic acids-based materials:
-Bio-plasticiser
-feed additive
-Organic fertilizer
-bio-plastics

Fiber-based materials:
- For insulation
- PHA-fibre composite

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
1) bio - based products / services *in order to diminish the amounts of waste generated by humanitarian interventions*
2) bio - based technologies *in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The application of this solution offers bio-based by-products that could be used in future packaging for humanitarian aid goods. Also, the technology used could lower the heterogeneous bio-waste from a specific area, as well as convert this waste into high value compounds for the industry. However, the infrastructure needed for this type of solution appears to be complex.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*
TYPICAL NON-FOOD ITEMS	
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.	
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.	
Medical supplies, wheelchairs, cold boxes.	

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Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs
.....
Conceptualization and planning
Procurement – sourcing/ purchasing of products and services
The application of this solution offers bio-based by-products that could be used in future procured humanitarian aid goods. Nevertheless, even though they come from a bio-based by-product this is not necessarily biodegradable.
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
.....
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services

15. SYNOPROTEIN – process converting residues from sawmills into single-cell proteins for fish feed and for producing biochar for animal feed

Responsible partners: AIMPLAS
INVESTIGATION LINE: II

Solution 15 **not on the final List**	**SYNOPROTEIN**
Product / service	
Technology	
I. Basic information	
Description of functions *What is the effect or final product?*	

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SynoProtein aims to develop and demonstrate a process that converts residues from sawmills into single-cell proteins for fish feed, as well as producing biochar for animal feed.

Description of technology and TRL level (if applicable)

N/A

.....

Description of product/service and TRL level (if applicable)

N/A

Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure.
Please include the optimal scale/size of investment at which their solution or technology makes economic sense
What kind of waste the solution is able to utilize or valorise?
To what extent does the use of a given solution or technology depend on climatic conditions?
Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

This project aims to create products for feedstock such as proteins for fish feed, as well as producing biochar for animal feed, therefore it is not considered relevant for humanitarian aid purposes.

Solution owner and his willingness to provide detailed technical and technological data

.....

Has the Life Cycle Analysis been already done for this solution?

.....

Source of data

https://synoprotein.eu/

https://www.cbe.europa.eu/projects/synoprotein

References
Please include a description and a photo of any examples of the implementation.

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Funded by the European Union

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Please describe below how the solutions addresses the needs.

IV. Logistic supply chains application potential - in which stage?

The 'humanitarian supply chain' *is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

.....

Conceptualization and planning

Procurement – sourcing/ purchasing of products and services

Goods collection in warehouses and repacking for transport to final destination

.....

Custom clearance

.....

Transport to the destination country (often multi-stage and using different modes of transport)

.....

Transport to the final destinations – last mile

.....

Storage at the final destination

.....

Operational logistic at final destination - distribution of goods and services

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16. FURIOUS – development of versatile bio-based polymers with potential to replace traditional plastics

Responsible partners: AIMPLAS
INVESTIGATION LINE: II

Solution 16 **not on the final List**	**FURIOUS**
Product / service	X
Technology	

I. Basic information

Description of functions

What is the effect or final product?

FURIOUS is developing versatile bio-based polymers that can replace traditional plastics. The materials will be designed for three areas in which traditional plastics are still widely used: biomedical and electronic packaging; the automotive sector; and underwater devices.

Description of technology and TRL level (if applicable)

TRL 2.

.....

Description of product/service and TRL level (if applicable)

TRL 2. Furan based polymers are not commercialized yet. They will need at least 2 more years of research until they can be commercialized.

Basic conditions of use

Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense

This project offers diversified bio-based polymer products thought innovative technological activities. There is no information of a current available public infrastructure nor an economic investment.

What kind of waste the solution is able to utilize or valorise?

Sugary agricultural waste

To what extent does the use of a given solution or technology depend on climatic conditions?

Information about climate conditions variability of the project is not provided.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

This solution could not be proposed as a mobile and autonomous unit.

Solution owner and his willingness to provide detailed technical and technological data

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.....

Has the Life Cycle Analysis been already done for this solution?

.....

Source of data
https://www.furious-project.eu/impact
https://www.cbe.europa.eu/projects/furious

References
Please include a description and a photo of any examples of the implementation.
N/A

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

Reduction of fossil origin plastics, mechanical recyclability, enzymatic depolymerization, chemical re-polymerization, compostability, biodegradability.

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The solution offers bio-based products with less impact than conventional plastics

IV. Logistic supply chains application potential - in which stage?

***The 'humanitarian supply chain'** is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*
TYPICAL NON-FOOD ITEMS	
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.	

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Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.
Please indicate the link of the supply chain for which the solution can be applied? Describe how.
Identification of needs
.....
Conceptualization and planning
Procurement – sourcing/ purchasing of products and services The project could help create new biomedical goods to procure with less impact in packaging
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
The project could help lower the carbon footprint of transportation by using the more sustainable automotive products
Transport to the final destinations – last mile
The project could help lower the carbon footprint of transportation by using the more sustainable automotive products
Storage at the final destination
.....
Operational logistic at final destination - distribution of goods and services

17. Bio-LUSH – production of high-value fibres for textiles, food packaging and reinforced composites by using plant resources such as forest residues, marine plants and weeds

Responsible partners: AIMPLAS
INVESTIGATION LINE: II

Solution 17 **not on the final List**	**Bio-LUSH**
Product / service	

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Technology	X

I. Basic information

Description of functions

What is the effect or final product?

Produce high-value fibres for textiles, food packaging and reinforced composites by using plant resources such as forest residues, marine plants and weeds.

.....

Description of technology and TRL level (if applicable)

Develop an innovative process for refining the fibres and converting them into functional bio-based materials. Between the technology used for the processes take advantage of existing equipment focusing on water-based formulations, energy-efficient methods like melt compounding and water-assisted spinning/coating/casting and 3D printing.

TRL 3-4 (developing green and scalable processing methods).

.....

Description of product/service and TRL level (if applicable)

Eco-designed bio-based products as fibres, nanofibers and lignin nanofibers from underutilized feedstocks (pilot-scale demonstrations). TRL 4.

.....

Basic conditions of use

Please include also minimum requirements of a given solution regarding the availability of public infrastructure. Please include the optimal scale/size of investment at which their solution or technology makes economic sense

The minimum requirement for the humanitarian chain leaders should be the implementing of these high-value fibres in new products, especially for food packaging or textiles which are the categories that have the highest percentage of waste generation.

The size of investment will depend on the amount of products using the bio-based solution. The cost should be less than products made with traditional plastics. It also depends on the scalability of the low-cost process for locally collected material.

What kind of waste the solution is able to utilize or valorise?

Some of the wastes that are used are plant resources as forest residues, marine plants, and weeds.

To what extent does the use of a given solution or technology depend on climatic conditions?

Neither the technology nor the fibres provided are affected by climatic conditions.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

One of the objectives that the projects aim at is to elaborate a low-cost process for small-scale production so it can suit to process locally collected material.

.....

Solution owner and his willingness to provide detailed technical and technological data

Data provided by public deliverables on the project website https://biolush.eu/deliverables/.

Deliverables will be uploaded in the future.

.....

Has the Life Cycle Analysis been already done for this solution?

There is planned one Life Cycle Assessment about which can cover toxicity data of processes and products, effluent streams and CO_2 emissions. No information found.

.....

Source of data

https://biolush.eu/

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.....

References

Please include a description and a photo of any examples of the implementation.

No information found.

.....

II. End-of-life stage addressed by the solution

Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

The high-value fibres ensure sustainability, safety, and recyclability through green chemistry principles, non-hazardous components, and circular economy standards.

.....

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

On the one hand the high-value fibres have lower potential environmental impact than the ones crafted with fossil fuels.

On the other hand, the technology offers the possibility of using local sources such as agricultural by-products, weeds, aquatic plants, and forestry residues reducing transport costs and greenhouse gas emissions.

.....

IV. Logistic supply chains application potential - in which stage?

***The 'humanitarian supply chain'** is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*

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TYPICAL NON-FOOD ITEMS
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.
Medical supplies, wheelchairs, cold boxes.
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.
Paper, printed products, office equipment, electronic waste, etc.
Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc.

Please indicate the link of the supply chain for which the solution can be applied? Describe how.

Identification of needs

.....

Conceptualization and planning

There should be a plan to install the small-scale production plant in zones where agricultural by-products, weeds, aquatic plants and/or forestry residues can be taken and used to produce bio-based fibres.

It would be also necessary to plan well in advance which products with these fibres can be sent to the destination from the available locations (from Europe, final destination or destinations near the final destinations), so the logistics can be defined to optimize the transport and reduce the carbon footprint.

.....

Procurement – sourcing/ purchasing of products and services

Transitioning from traditional fibre products to biofibre-based helps to reduce the environmental impact of them.

.....

Goods collection in warehouses and repacking for transport to final destination

.....

Custom clearance

.....

Transport to the destination country (often multi-stage and using different modes of transport)

.....

Transport to the final destinations – last mile

.....

Storage at the final destination

The small-scale production plant can be also combined with storage locations in order to optimize storage and waste management.

.....

Operational logistic at final destination - distribution of goods and services

Bio-based fibres offer easier ways of recyclability thanks to green chemistry principles, also contributing to circular economy standards at the end of the supply chain, where most of the waste is generated.

.....

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18. CHAMPION – replacing conventional polymers with bio-based polymers for coatings, textiles, home care and structural adhesives

Responsible partners: AIMPLAS
INVESTIGATION LINE: II

Solution 18 **not on the final List**	**CHAMPION**
Product / service	
Technology	

I. Basic information

Description of functions
What is the effect or final product?

Replace conventional polymers with bio-based polymers for coatings, textiles, home care and structural adhesives by ensuring that these products are biodegradable and/or suitable for recycling.

.....

Description of technology and TRL level (if applicable)

Development of green, sustainable and scalable process for synthesis of the aza-Michael reaction donor an acceptor molecules in a lab-scale. Once it is done, it is time to scale up to produce sufficient amounts for testing. TRL 3-4.

.....

Description of product/service and TRL level (if applicable)

Coatings.

Car interior surfaces with reduced environmental footprint.

Structural adhesives.

Home care formulations.

All the products have a TRL ≥ 5.

.....

Basic conditions of use
Please include also minimum requirements of a given solution regarding the availability of public infrastructure.
Please include the optimal scale/size of investment at which their solution or technology makes economic sense
What kind of waste the solution is able to utilize or valorise?

One requirement is related with using vehicles that have these biopolymers for the interior surfaces of the car. And bearing in mind the rest of the products for the target applications, another requirement would be transitioning to new home-care formulations in order to donate products with a high performance and biodegradability.

The size of the investment would not be really high.

Biodegradability of the new polymers is the key for the wastes that are going to be generated, as well as recycling options.

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To what extent does the use of a given solution or technology depend on climatic conditions?

Neither the technology nor the products depend on climatic conditions.

Is it possible to refine the solution as an autonomous and mobile unit? (if applicable)

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.....

Solution owner and his willingness to provide detailed technical and technological data

The website of the project provides all the information about deliverables and public documents.
https://www.champion-project.eu/work-areas

.....

Has the Life Cycle Analysis been already done for this solution?

Work Area 2, Step 4.

.....

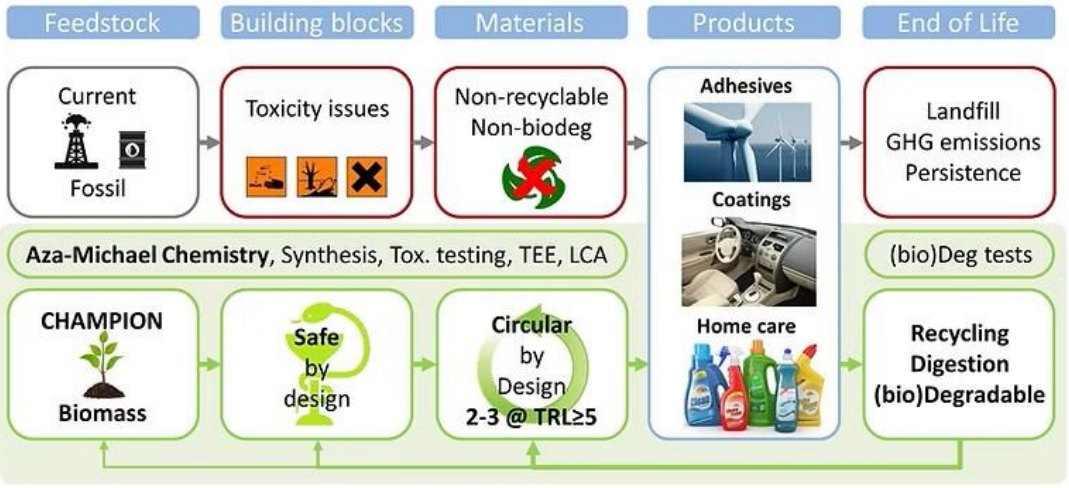
Source of data

https://www.champion-project.eu/work-areas

.....

References

Please include a description and a photo of any examples of the implementation.



https://www.champion-project.eu/work-areas

II. End-of-life stage addressed by the solution

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Please describe if the solution refers to 4R Principle (Reduce, reuse, recycle, recover) biodegradability, composability or other means of end-of-life stage.

A key part for the circularity of the bio-based polymers is finding end of life solutions as recycling and biodegradability. By this way, it will help to reduce the environmental impact at the Life Cycle Assestment.

The programme also will include chemical recycling and controlled energy recovery system.

.....

III. Needs of the humanitarian sector and / or of the solid waste management constraints in the humanitarian settings addressed by identified solution

We are looking for:
***1) bio - based products / services** in order to diminish the amounts of waste generated by humanitarian interventions*
***2) bio - based technologies** in order to cope with the amounts of waste generated in the humanitarian context.*

The expected characteristics of the bio-based solutions potentially applicable in the humanitarian context:
· ability to eliminate the humanitarian waste, i.e. plastic, aluminium, metal, glass, paper & cardboard, organic, wood, medical and chemical;
· sustainability – addressing environmental, economic, and social factors; be adaptable to local conditions; provide long-term benefits without unintended negative consequences;
· utilization of local resources and knowledge.

In case of a doubt as for the applicability of a given product, service or technology in the humanitarian context – please consult the Humanitarian Assessment Report prepared by People In Need and Polish Humanitarian Action. The Report is enclosed; also available in the SharePoint.

Please describe below how the solutions addresses the needs.

The four new bio-based aza-Michael-addition polymers increase the overall resource efficiency and at the same time reduce greenhouse gas emissions.
They will also help to validate and improve technologies in industrial-scale production processes.

.....

IV. Logistic supply chains application potential - in which stage?

***The 'humanitarian supply chain'** is defined as: "The planning, procurement, storage, transport and delivery of different forms of supplies, works & services used for projects and to respond to emergencies. This includes the flow of supplies from origin to destination but also more complex work of forecasting, optimising resources, value for money to ensure the most efficient process, and decreasing the carbon footprint of related operations"*

Type of waste in humanitarian context:

COMMODITY TYPE	***PACKAGING***
Grains, cereals	*Virgin woven PP bags*
Cornmeal, fortified flour	*Hybrid paper bags and PP woven bags with PE*
Fortified vegetable oil	*Steel cans, plastic bottles, cardboard cartons*
Specialised nutritious food products	*Metallised flexible plastic sachets and pouches, plastic box liners, cardboard cartons*
TYPICAL NON-FOOD ITEMS	
Tents, shelter kits, tarpaulin, synthetic sleeping mats, blankets, clothes, mosquito nets, timber, cement.	
Nutrition-specialized products, such as Ready-to-Use Therapeutic Food (RUTF) and Ready-to-Use Supplementary Foods (RUSF); for example, Plumpy'Nut, vitamin A supplements, iron-folic acid supplements, and micronutrient supplements. These can be on tinplate or laminated packaging structures.	
Medical supplies, wheelchairs, cold boxes.	
Jerrycans/buckets (water containers), water purification tablets (Aquatabs, PUR), Water pumps, hygiene products (soap), menstrual hygiene products (single-use pads, reusable pads-ex. AFRIpads), water testing products, chemicals (such as chlorine), and equipment (for pump mechanics).	
Stoves (fuel-efficient saving stoves), seeds, farming tools (hoes, axes, rakes, watering cans, buckets), storage (bags and sacks), fertilizers, pesticides, etc.	
Paper, printed products, office equipment, electronic waste, etc.	

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Petroleum, oil, and lubricants. Electrical transformers with polychlorinated biphenyls (PCBs). Chemicals such as acid, chlorine, and pesticides. Asbestos-containing materials. Treated timber, etc. *Please indicate the link of the supply chain for which the solution can be applied? Describe how.*
Identification of needs
.....
Conceptualization and planning
.....
Procurement – sourcing/ purchasing of products and services
Buying vehicles which have less greenhouse gas emissions. .....
Goods collection in warehouses and repacking for transport to final destination
.....
Custom clearance
.....
Transport to the destination country (often multi-stage and using different modes of transport)
.....
Transport to the final destinations – last mile
Reducing the environmental impact of the logistitcs part by using polymers with lower greenhouse gas emissions in car interior surfaces. .....
Storage at the final destination
Reducing the environmental impact of the storage by using polymers with lower greenhouse gas emissions in car interior surfaces. .....
Operational logistic at final destination - distribution of goods and services
Offering circular solutions for the end of life stage of home care products to reduce environmental impact of the part of the supply chain that generates the highest amount of wastes. .....

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