FISSAC

FOSTERING INDUSTRIAL SYMBIOSIS FOR A SUSTAINABLE RESOURCE INTENSIVE INDUSTRY ACROSS THE EXTENDED CONSTRUCTION VALUE CHAIN

Exploitation Plan: Exploitation procedures, plans and strategies

Executive summary

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Exploitation, in this context, refers to an action of making use of and benefiting from Project's results. The Exploitation Plan illustrates what such results are and suggests the strategy of how to make the most use of them. This Exploitation Plan provides:

- Project's exploitable results
- Exploitable results characterization
- Exploitation routes
- Risk assessment
- Technology Readiness Level status
- Individual partners' exploitation expectations
- Market analysis

The first exploitation workshop took place during the third project meeting in Brussels (5.-6. October 2016). The second exploitation workshop took place during the second day of the fifth project meeting in Stockholm, Sweden (4-5 October 2017). Information provided by partners as well as consortium discussions during the workshops, served as the basis of the Exploitation Plan creation and its update.

Exploitable results

The first step for developing comprehensive Exploitable Plan is to identify the list of Exploitable Results (ERs) developed within the FISSAC project. The following table summarizes updated FISSAC's ERs.

N°	Exploitable Result	Lead partner
1	FISSAC Model: IS methodology regarding the construction value chain	ACC
2	FISSAC Model: IS Platform	EKO
3	The guidelines and training courses on circular economy planning	ACR+
4	Cement based products eco-design	AKG
5	Light wall ECO-Tiles (and eco-design)	KER
6	Urban porcelain ECO-Tiles (and eco-design)	KER
7	Wood Plastic Composites WPC eco-design	VAN

Exploitation routes

Once the ERs are identified, exploitation routes can be tailored to each of the ERs. The exploitable routes revolve around:

- The use for further research
- Developing and selling new products/services
- Spin-off activities
- Cooperation agreement/Joint Ventures
- Selling IP rights/Selling IP-related business
- Licensing IP rights
- Standardization activities

The exploitable routes of FISSAC's project results are as follows:

ER	Exploitation use
1	• The consulting and research partners creating internal consulting services for applying the FISSAC model • Internal benefits of applying internally the model to partners participating in the construction value chain: steel, ceramics, glass, chemical • Joint venture among all or part of the partners providing these services • Spin-off for providing services
2	• Utilisation for the studied sectors for decision-making/monitoring • Enhancement of the library and use for broader range of consultancy services • Creating internal consulting services for geo-clustering and logistics • Sales as a software platform • Sales as SaaS – Software as a service
3	• Creation of sustainable construction guidelines specifically for local and regional authorities, to better understand and provide good practice examples on how to set a positive framework for sustainable practices in the construction value chain • Dissemination to local and regional authorities targeted by the FISSAC project • Creating internal training services – direct training and webinars
4	With the successful results of both laboratory studies & industrial production and application phases, it is expected to add the alternative raw materials and techniques to the related BAT reference documents and standards. It is used anywhere that wall blocks used.
5	Worldwide commercialization through: - Direct sale - Distributors - (Licensing)
6	Worldwide commercialization through: - Direct sale - Distributors - (Licensing)
7	A commercially viable product to help the circular economy

IPR management

Effective exploitation of the Exploitable Results depends, among others, on the proper management of intellectual property. There are several activities related to IPR, namely, assessment of pre-existing of the project partners, assessment of the results generated during the project, proposition of the

optimal IPR protection options, ownership and proper implementation of IPR protection measures.

The IPR protection for each of the ERs, suggested by the FENIX IPR expert, proposes that first four ERs should be protected by the copyright while the last four ERs should file for patent, utility model or industrial design.

Technology Readiness Level (TRL)

The TRL scale is a metric for describing the maturity of a technology. Its scale consists of 9 levels representing the progress in the development of a technology where level 1 refers to an idea of a product while level 9 represents the full deployment of the product in the market.

The following table summarizes the expected development of each of the ERs within the FISSAC project.

ER	From TRL	To TRL
1	6	8
2	6	9
3	N/A	N/A
4	4	6
5	5	7
6	5	7
7	5	6

Partners' role in the project and their BFMULO

ACCIONA: coordinates and leads the management of the FISSAC project as a promoter and close point of the extended construction value chain. It is active partner participating in the development and demonstration of FISSAC implemented technologies and FISSAC model.

ACR+: leads the dissemination work package as well as social engagement and acceptance task.

UNE: advices, manages and develops activities related to standardization.

CSIC: participates in reformulation of ceramic tiles composition and reduction of raw materials consumption by introducing waste in the ceramic tiles composition formula. It also contributes to the design of new materials and will provide demonstration of FISSAC implemented technologies and model.

AKG: participates in the development of new products based on secondary raw materials and demonstration of FISSAC implemented technologies and products.

BEF: participated in activities related to life-cycle analysis of aluminium and it will act as secondary raw material supplier.

BGM: provides knowledge in the field of glass and participates in replicability activities.

CBI: contributes to the development of the ER1, ER2 and ER5.

CSM: provides detailed characterization of materials and participates in defining the best mixture for eco-cement as well as it serves as technical support in eco-cement development.

RINA C: is technical leader for the development of the FISSAC ICT Platform part called "Engagement, Opportunity identification & Marketplace" which aims to attract possible users, facilitate the collection of information related to industrial symbiosis (IS), simplify the research of georeferenced IS opportunities among facilities and monitor the established IS. EKO: participates in sustainable design and environmental management. RINA C is also responsible of the definition and validation of the FISSAC Model.

EKO is the lead partner of the FISSAC model for industrial symbiosis.

FAB: participates in the development and demonstration of FISSAC implemented technologies and products

FEN: contributes to the development of new business models for industrial symbiosis and exploitation activities.

FER: acts as secondary raw material supplier of steel

GEO: participates in developing the software platform tool

GTS: acts as secondary raw material supplier of glass

TRI/IBT: participates in eco design of the new products by considering the economic, environmental, technical perspectives as well as market factors and innovation points

HIF: is responsible for development and establishment of a Living Lab in Sweden and demonstrating the replicability potential of FISSAC model.

KER: participates in validation and demonstration of industrial symbiosis principles within the ceramic sector and conducts a close loop recycling pilot with aluminium and natural stone waste. KER also participates in the development of new products based on secondary raw materials and in demonstration of FISSAC implemented technologies and products.

OVA: The OVAM participates as a stakeholder in this project. As a competent (regional) government body with experience in the development and follow-up of policies, business models, partnerships they can offer insight and steering during the research process. They can assist in the drawing up of the conclusions of the reports and help in making the findings and information from the research useful and practical to government and other institutions involved in the development, implementation and evaluation of policies regarding sustainable and efficient resources and materials management.

RINA-S: evaluates the environmental performance of each closed loop recycling process designed according the EU Environmental Technology Verification (ETV).

RISE: is responsible for ecological and economic evaluation of the developed processes in WP3. RISE also evaluates non-technical opportunities and obstacles for different business models.
SYM: assists as an industrial symbiosis expert in the management tools.
TCM: participates in the development of new products based on secondary raw materials and demonstration of FISSAC implemented technologies and products. TCM collaborates on the demonstration of the replication of FISSAC model.
TEC: participates in setting the basis for the industrial symbiosis as well as in the development of new products based on secondary raw materials and demonstration of FISSAC implemented technologies and products.
ECO: has ability to carry out real world manufacturing trials on the latest evolution of top-quality twin screw conical & parallel extruders. They are able to consult on material compositions, process flow & tooling design.

Risk assessment

To manage and mitigate risks, which might represent a threat to the project, it is necessary to identify them first. Once the risks are pointed out, one ought to evaluate the likelihood of their occurrence and estimate the impact they might have on the FISSAC project. At the same time, it is crucial to define actions which could prevent the identified risks.

The risks identified were divided to six categories – technological risks, partnership risks, market risks, IPR/Legal Risks, management and financial risks, environmental, regulation, safety and other risks – and evaluated according to the level of threat they might bring (from insignificant to catastrophic). Last, the likelihood of appearance of each risk was assessed. Altogether, these data provided information on the status of each risk ranging from "low" to "unacceptable".

Likelihood	Impact				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	Low	Low	Low	Low	Moderate
Unlikely	Low	Low	Moderate	Moderate	High
Moderate	Low	Moderate	Moderate	High	Very high
Likely	Low	Moderate	High	Very high	Unacceptable
Certain	Moderate	High	Very high	Unacceptable	Unacceptable

The Second Exploitation Plan revealed that there are 9 very high and 0 unacceptable risks associated with the FISSAC project. The risks are being properly monitored and managed.

Market assessment

To properly evaluate the FISSAC's ERs and their prospect position on the market, market assessment is essential to be performed. This assessment identifies and examines relevant markets and evaluates the opportunities for the ERs.

The industries identified with significant potential for industrial symbiosis are: Ferrous metal industry, non-ferrous metal industry, chemical industry, automotive industry, cement industry, and construction industry. The markets analysed were European "Green market", secondary raw material market and to it linked material flows assessment.

It especially focused on light and urban stoneware ceramic tiles and eco-cement and green concrete and it analyzed:

- Market (demand, volume, competitors, future trends)
- Industry (production, main players and producers – potential stakeholders for IS)
- Related/overlapping patents
- Competing products/projects
- Other commercial initiatives
- Other related information

Last but not least, the networks/projects dealing with similar topic as the FISSAC does were identified.

Industrial symbiosis network name	Location	Types of waste used for industrial symbiosis
Guitang Group	China	5,6
Biopark Terneuzen	Netherlands	21,22
Harjavalta Industrial Eco-Park	Finland	4,8,9,10
Bazancourt-Pomacle	France	21,22
Kawasaki eco-industrial park	Japan	8,12,14,18,21,22,28
Fujisawa eco-industrial park	Japan	5,14,21,22,24
Kalundborg	Denmark	4,5,21,22,33
Kwinana	Australia	4,8,29,33
Barceloneta	Puerto Rico	1,5,7
Nanjangud	India	4,12,28,33
Östergötland	Sweden	12,13,14,24,33
Guayama	Purto Rico	33
Taiheiyo Cement	Japan	8,12,13,14,28,29
Midlands foundry sand	United Kingdom	29
Tunweni	Namibia	21,22
Cambridge tyres	United Kingdom	13
Styria	Austria	3,8,12,13,29
Gladstone	Australia	33
Tampico	Mexico	4,14
NISP UK	United Kingdom	0
La Borsa de Subproductes de Catalunya (BSC)	Spain	5,7,12,14,28
BPS	United States	8,21,33
SMILE	Ireland	12,14,15,18,28
OWM	Portugal	28
ZeroWIN research project	EU-27 (FP7	15,18,28

Conclusion

The aim of this deliverable was to provide second version of the Exploitation plan for FISSAC project results. On top of the first exploitation plan, this plan contains updated results' characterization and their exploitable roads, updated TRL and BFMULO matrixes, as well as method for further actions regarding the IP and exploitation rights shares, and risk assessment for all FISSAC exploitable results.

The creation of the Deliverable was supported by the first and second exploitation workshops, during which modifications in the list of exploitable results were discussed and characterizations of individual results were updated. The goal of the report is also to prevent

occurrence of IPR infringement and to mitigate risks that could endangered the exploitation.

Fenix will secure involvement of all project partners in exploitation activities, guide them through the process and encourage them to contribute to the exploitation.