

ReNEW

Resource innovation Network
for European Waste

ReNEW Action Plan

Roadmap for Innovation
in Resource Recovery

Investing in Opportunities



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INTERREG IV B

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The INTERREG IVB Programme funds projects which contribute to a cohesive and sustainable territorial development of North-West Europe. It supports transnational cooperation to address common challenges of Member States, regions and other authorities. In doing so, it strengthens the area's territorial assets and harnesses their potential.

For more information about INTERREG NWE, go to <https://www.nweurope.eu/index.php>

Amélie Joveneau was the lead author of this Action Plan. We express our deepest gratitude to her and the others who made contributions to the plan.



The ReNEW project was funded under the INTERREG IVB programme (priority 1) for 34 months, from January 2013 to October 2015. It sought to address the important issue of innovation in resource recovery.

Currently, many materials reach the end of their lives and are viewed as 'waste' and treated as a problem, with the solution being a method to dispose of them as cheaply as possible. This typically involves either disposal in a landfill or incineration. But there is a growing recognition that cheap doesn't mean best. We live in a finite world: we do not have endless resources to use in a linear fashion. A new model is required, one in which materials are treated as precious resources to be recycled, repurposed, and rescued from their previously inevitable fate.

The circular economy is such a model. The circular gives us a framework to effect a fundamental transformation in the way we manage the world's resources. Changing the way we produce and consume will keep materials in the economy for longer. There are opportunities for everyone to enhance and responsibly curate our global environment and economy.

However, not all of the technical processes needed to make the circular economy functional are available. The ReNEW partnership was a response to the need to develop new methods for recovering resources that can be used as secondary raw materials, and to transform the process by which such methods are developed: innovation. The partnership consisted of experts in

innovation in Northern Ireland, Ireland, Belgium, and Germany. As well as enhancing innovation in the partnership and in industry, the partnership set out to inspire policy change and increase understanding throughout North-West Europe (NWE), in order to strengthen the foundations required to effectively change the way we live.

As the project progressed, the members of the ReNEW partnership learned valuable lessons about many aspects of the journey we are all on. We present our Action Plan, designed to help the essential innovation happening in Europe today.

The world we live in is changing, and the knowledge we have and can share with others is becoming increasingly valuable. We recommend this Action Plan to everyone, as everyone can positively influence behaviour in ways we previously thought impossible.

Gary Sheldrake
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Understanding for all

Promote resource recovery
with the circular economy

Resources, not waste

Develop integrated material management
strategies to replace waste management strategies

Access to innovation

Improve the availability
of pilot plant facilities

SME participation is vital

Increase business participation
in resource recovery innovation

North-West Europe (NWE) is a highly urbanised and industrially productive area of Europe: it has been described as the economic powerhouse of Europe. As with the rest of the developed world, a linear resource model (take, make, dispose) is in place in NWE. This linear way of life relies on the availability of cheap materials and energy. However, there are shortfalls with this model. We live in a finite world: indiscriminate use of natural resources cannot continue at anywhere near the same rates. The use of fossil fuels as sources of energy is already resulting in climate change with inevitably catastrophic consequences for the Earth and its population.

As the population of the world grows, and the expectations for the quality of life of those people increase, the demands on a world with finite resources will increase to the point where the demands cannot be met. Increasing resource efficiency is part of the solution, but it cannot prevent the inevitable collapse of the linear economy.

In 2012 the European Commission and the European Parliament adopted the following text on the Resource Efficiency Roadmap:

"By 2020, waste is managed as a resource. Waste generated per capita is in absolute decline. Recycling and re-use of waste are economically attractive options for public and private actors due to widespread separate collection and the development of functional markets for secondary raw materials. More materials, including materials having a significant impact on the environment and critical raw materials, are recycled. Waste legislation is fully implemented. Illegal shipments of waste have been eradicated. Energy recovery is limited to non-recyclable materials, landfilling is virtually eliminated and high quality recycling is ensured."

So an alternative exists. What if we could take things we view as worthless and only fit to be discarded, and instead recover all the value in them? Then things we think of as waste, can actually be considered as

a resource. This philosophy culminates in eliminating waste altogether, but to do that, we must build ways of dealing with materials so that they remain available in some function for as long as possible.

Resource recovery is when we extract valuable chemicals or energy from materials that would otherwise be treated as waste. The chemicals we extract can be called resources, and can be used as raw materials (from a secondary source) in the same way that raw materials from primary sources like mines and oil wells are used. By doing this we extract more value from materials, reduce the pursuit of primary raw materials that must be extracted by traditional routes, and reduce the amount of waste we generate.

When we can efficiently keep resources recycling and regenerating for as long as possible, markets will develop to trade in these recovered resources with the same volume and value as primary raw materials, there will be no further drive to extract and dispose of primary resources as if they were in endless supply. This is what we know as the circular economy. Resource recovery is a key concept in the circular economy, and the development of processes to produce secondary raw materials is the opportunity that ReNEW aimed to take advantage of.

The ReNEW (Resource innovation Network for European Waste) project was proposed as a way for organisations from different parts of Europe to share their experiences and expertise with each other, and collaborate to accelerate innovation in resource recovery. The nature of resource recovery means that the best ideas often require input and support from many disciplines, and so ReNEW built a team of experts to tackle the challenges confronting the resource recovery sector:

1) How many people know about resource recovery and the circular economy?

We knew that some parts of Europe were further ahead in their efforts to reduce waste being dumped into landfills than others, and so we wanted to try and engage as many people as possible and provide them with more information, and to get their support for, and participation in, the transition to a circular economy.

2) How could we help people who wanted to develop resource recovery processes?

We didn't know if there was enough support for those groups (academic researchers and commercial enterprises) who wanted to make advances in resource recovery, and so we carried out a European-wide survey, developed a roadmap for some processes we thought would be important, and we supported companies who wanted help in developing their own resource recovery processes.

3) Was there enough support for innovation in resource recovery?

We supported ReNEW partners who wanted to innovate in resource recovery. By sharing our expertise and experience, we made faster improvements in processes, helping them get to market quicker.

4) How could we promote and encourage new technologies and new markets?

We tried to link up innovators with technological solutions with those who had problems. We also sought to help those who could introduce policies to support the markets that would emerge in the future by connecting countries who had more developed clean tech communities with those who didn't, and we tried to show everyone the economic potential for resource recovery within the circular economy framework.

The experiences we had while working in ReNEW gave us an authoritative perspective on what could be done in the future to further accelerate resource recovery. This Action Plan is the result of those experiences, and the discussions we have had to understand them. We aim to contribute to the objectives of the European 2020 strategy, and the Circular Economy package when it is published later this year (2015). The overall objective of our action plan is to help in the development of a sustainable industrial base for job creation. This will be achieved by changing societal and business models for thinking about and dealing with waste, and by accelerating innovation in resource recovery. All three of these aims will be implemented through 4 action recommendations:

- 1 Understanding for all
- 2 Resources not waste
- 3 Access to innovation
- 4 SME participation is vital.

The connections between the aims and the actions are summarised in Figure 1.

Our Action Plan doesn't contain any technical information, but is intended to connect those who are the technological innovators with those who see the potential for the future that those innovations will bring. We commend the Action Plan to all those who wish to learn about the circular economy and the wealth of benefits it could bring.

For more information about ReNEW, please go to <http://www.renew-network.eu/>

Objective tree

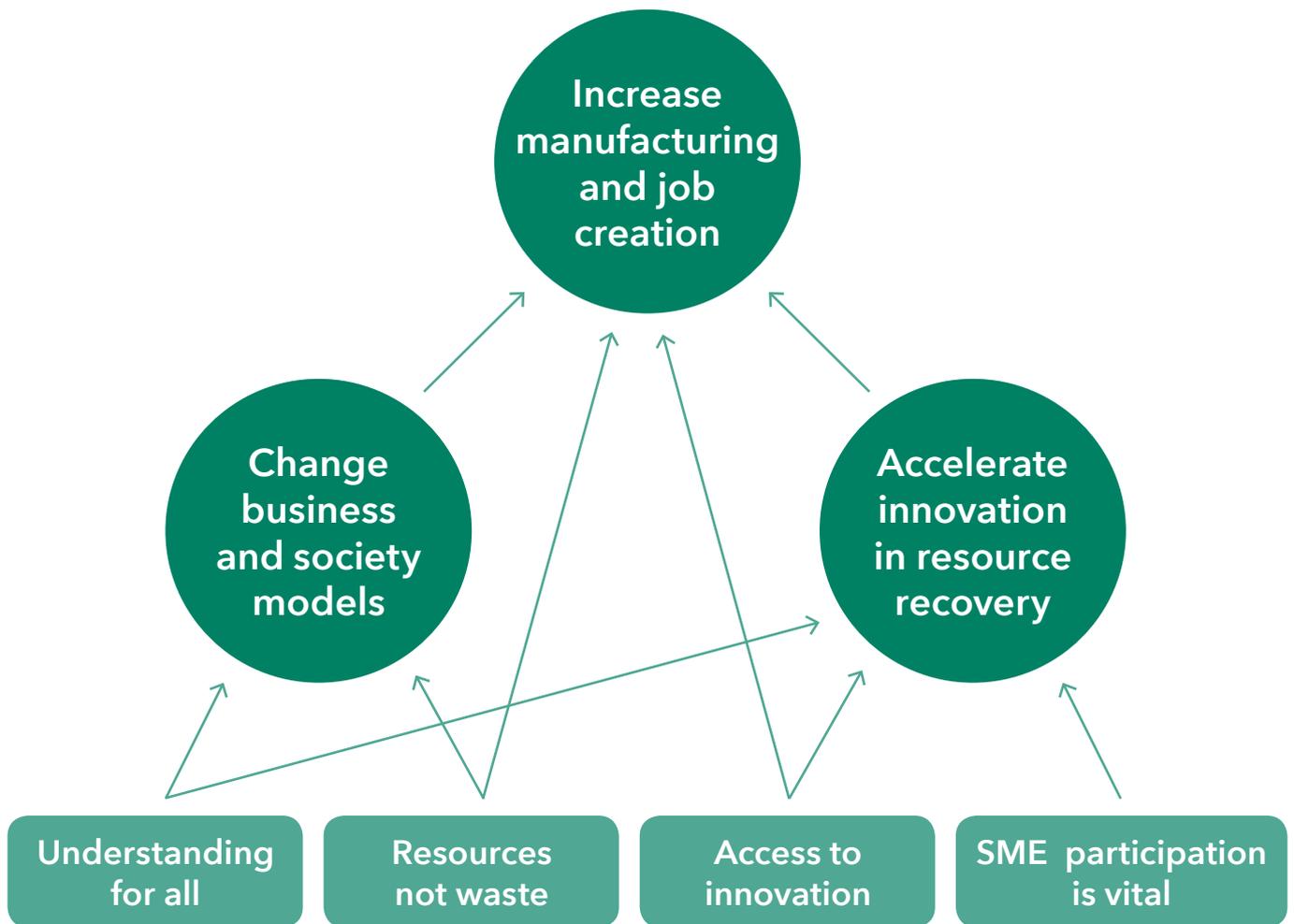


Figure 1: The connections between the aims of the Action Plan and the actions to achieve them

Recommendation 1

Understanding for all

Promote resource recovery and the circular economy

ReNEW was a partnership borne of an identified need by experts within the waste and clean technology sectors. Our awareness of the issues was well established, but it isn't like that for everyone. Greater understanding would increase support for the changes that will take place during a shift away from the linear economic model, and highlight the opportunities for all sections of society.

What we found out in ReNEW

Everyone is a stakeholder in the circular economy. When talking to people about ReNEW, we decided to define stakeholders in four broad, but not necessarily exclusive, categories:

- 1 Individuals and groups who we could tell more about resource recovery and the circular economy at a non-technical level: the general public;
- 2 Innovators, researchers, and commercial entities (SMEs, industry) seeking to collaborate with others to improve resource recovery processes;
- 3 Policy makers and government advisors seeking to understand more about the potential of resource recovery innovation in the future, and the route to achieving a circular economy, in order to shape future national and local government strategy;
- 4 Funders, entrepreneurs, and other investment organisations who see opportunity within an emerging market.

The different types of stakeholders have different requirements of understanding. ReNEW has encouraged using a more general language which is suitable for communication of ideas to non-expert audiences. Type 1 stakeholders seemed to be supportive, but have a limited understanding of resource recovery. Groups that can be considered to have a vested interest (2, 3, and 4) did have some knowledge about resource recovery and the circular economy, but in many cases it was limited.

For example, ReNEW organised for Belfast City Council (BCC) representatives, along with Northern Irish MLAs (Members of the Legislative Assembly), to visit a research facility at :metabolon (a former landfill site in Germany), and travel to VITO and OVAM (who developed the materials management strategy for the Flanders region of Belgium). As a result, the BCC Head of Waste Management was tasked with developing a materials management strategy which would encourage the development of the circular economy in Belfast whilst dealing with the city's waste streams. The visit was also extremely valuable in engaging national policy makers with the aims and potential benefits of a circular economy.

What should be done in the future?

This action is necessary to reach the objectives of changing business and society models, and accelerating technological innovation in SMEs. Communication to all stakeholders should continue and increase.

Helping non-experts to understand how resource recovery can provide them with a better quality of life is essential to create and amplify new resource streams. The continuation of the work of ReNEW and other agencies is important to start filling in the gaps where information needed to make decisions is missing, such as investment and creating new policies to help encourage the circular economy. It is particularly important to stress not just the threats and weaknesses of the linear economy model, but to highlight the strengths and opportunities that will present themselves within the circular economy.

The Ellen MacArthur Foundation is at the forefront of promoting the circular economy, but involving the general public at a local level should be considered a priority. This can be carried out by public authorities and those science communicators who have a role in engagement and outreach.

How will this help?

Initiatives and action plans to foster innovation and the transition towards circular economy are flourishing at EU level. The transition must be fuelled by comprehension of, and support for, the changes that must occur during a shift to a blue economy. All parts of society will be affected by these changes, but not everyone is being informed equally, in particular the positive consequences that will emerge.

We will know this action has helped when we see more investment in resource recovery, and authorities start to give incentives for changes in behaviour, which will be the basis for collection of new resource streams.

How does this link up with EU strategy already in place?

The Resource Efficiency Roadmap¹ urges Member States, regional and local authorities to offer information and provide incentives for SMEs which should be complemented by networking SME advice at EU level as supported through the upcoming SME Green Action Plan.

The Green Action Plan for SMEs² recommends a better showcasing of technologies conducive to resource efficiency in awareness raising campaigns.

EEN³ will create a European Resource Efficiency Excellence Centre which will advise and support on technological options to increase resource-efficiency and cost-effectiveness of those options.

¹ http://ec.europa.eu/environment/resource_efficiency/documents/erep_manifesto_and_policy_recommendations_31-03-2014.pdf

² http://ec.europa.eu/enterprise/policies/sme/public-consultation-green-action-plan/index_en.htm

³ Enterprise Europe Network

Recommendation 2

Resources not waste

Develop integrated material management strategies to replace waste management strategies

In order to create the framework of the circular economy, and the position of resource recovery processes within that framework, we need to change the way we make decisions about waste and energy together.

What did we find out in ReNEW?

Responsibility for dealing with waste largely lies with municipal authorities, either by carrying out collection or commissioning the collection. Flanders was a pioneer in the field of materials management and materials technology (Flanders Material Program), and they have set in motion a series of initiatives designed to reduce waste and increase the life of materials previously considered waste.

But we realise that it is complicated. For example, in regions of Belgium and Germany, a landfill tax is coupled with a landfill ban for recyclable waste. This has resulted in a progressively lower landfill rate; materials previously destined for landfill have been successfully diverted. However, some of these materials are incinerated in energy from waste (EfW) facilities. Some incineration facilities are considered as energy recovery installations, and whilst this has currency in energy production, it is a less preferable fate for some materials in terms of the waste hierarchy. In addition, considering EfW as a desirable outcome for waste streams materials will potentially induce an overcapacity for waste incineration. These facilities must be profitable, creating a need for waste for incineration rather than recovering the more valuable resources it contains.

We have discussed how we would like authorities to provide incentives for renewable initiatives, but some current economic incentives are not coherent with principles embedded in the circular economy. There is support for energy production from biomass and waste because it is considered (from a Life Cycle Analysis perspective) that burning of biomass has no impact in terms of carbon emissions. A diversion of wood and other waste biomass to energy production will reduce the volume of the streams use as a resource.

Despite the closeness of 2020, waste and resource policies have not yet radically changed.

What should be done in the future?

We need those who manage waste to start thinking of it as a resource. For this to happen, we need to consider how all materials can be used to regenerate the resources they contain. In the wider context of the circular economy this includes product design and lifespan, but with respect to resource recovery this involves fully understanding the lifecycle of materials considered as waste. Businesses and consumers remain the key actors in this. The value chain of a resource needs to be fully described, to provide coherent incentives between producers, investors, distributors, consumers and recyclers, and ensure a fair distribution of costs and benefits.

In order to take the informed decisions about material management policies, there is a need to develop reliable and coherent decision-making tools. The tools are needed to decide and justify the best option for material streams, whether it is incineration or resource recovery or another fate. These tools can be used to inform legislation, and guide interventions at local, regional, national or European levels. The tools will bring more coherence between support for energy recovery and resource efficiency, and allow the integration of potentially conflicting outcomes for material streams.

A variety of agencies will be involved in this action. Academia and business will provide information about resource recovery and economic analyses of the regeneration of the resources. Public authorities will be responsible for the integration of this information with public policy at different levels. Businesses will inevitably be responsible for the enactment of many of these policies when it has been established that there is a financial gain to be achieved in resource recovery.

How will this help?

This action will contribute to changing economies from a linear to a circular model, and also accelerate of technological innovation in SMEs, because it should provide economic incentives and targeted investment schemes as well as better access to resources for making innovative eco-technologies profitable.

We will know this action helped when we see more research done into resource lifecycles. We will also see those with a role in dealing with our waste starting to describe it as a resource, and investing in resource recovery technologies.

How does this link up with EU policy in place?

The cornerstone of EU waste policy is the Waste Framework Directive: Directive EC/2008/98

It relies on 7 key principles: Polluter pays; self-sufficiency and proximity; Life cycle thinking; A five-step waste hierarchy where prevention is the best option, followed by re-use, recycling and other forms of recovery, with disposal such as landfill as the last resort; Waste classification; Targets: Recycling 50% of municipal waste and 70% of construction waste by 2020; and end of waste. End-of-waste criteria specify when certain waste ceases to be waste and obtains a status of a product (or a secondary raw material).

The EU Resource Efficiency Roadmap¹ recommends high-quality waste management and increasing recycling should be encouraged through better implementation and promoting best available techniques and research on materials. EU waste policy development should promote potential benefits of cross-border flows while combating illegal export.

¹ http://ec.europa.eu/environment/resource_efficiency/documents/erep_manifesto_and_policy_recommendations_31-03-2014.pdf

Recommendation 3

Access to innovation

Improve the availability of pilot plant facilities

Economic development agencies need to know where businesses can test new processes, get expert advice, and learn from those who have experience.

What did we find out in ReNEW?

Innovation facilities are placed where it is possible to go and test new technologies. In the case of resource recovery, this means being able to take a waste stream, manipulate it under different conditions, and see whether it is possible to collect a valuable resource as a result.

Early in the project, ReNEW organised a transnational Technology Foresight Workshop, where we identified streams of waste that could be used to create valuable secondary materials. We discovered that in NWE there were common streams, but pilot facilities were not equally spread through the region. We created a network through which we tried to make it possible for any business to get the best help available. Technological innovation is based on very specific expertise, and solutions to the challenges of scaling-up and commercialising can be more easily overcome when transdisciplinary dialogue is involved. ReNEW made it possible for partners to improve the innovation facilities on their sites, so that they could help others to improve their processes. We also promoted a voucher scheme, so that the cost of innovation was reduced for interested businesses. Technological demonstrations were organised at ReNEW partners' facilities during the project. They were targeted at researchers and SMEs, to encourage engagement with the wider resource recovery community. A database of fermentation was developed by ReNEW partners, which will enable businesses to get information about the best facilities available.

We discovered that although there was a diverse range of facilities for innovation across the NWE region, businesses (in particular SMEs) were limited in their willingness to travel to other regions to

explore the possibilities for help, despite the fact that the facility might be unique (and ideal).

What should be done in the future?

This action will contribute to the acceleration of innovation in SMEs. Pilot facilities are expensive, and a database containing information about what innovation facilities exist in Europe is needed, to create a single destination for businesses. The database will help to identify the need for new facilities, and reduce redundancy of existing facilities, so improving their efficiency and value for money. This would also help in the implementation of future voucher schemes, or other incentives to improve processes.

Innovation facilities and research centres also need to do a better job of promoting their facilities to businesses across the European community. Information sessions where scientists travel to the businesses would be more effective in communicating the opportunities available for innovation in resource recovery. Funding travel for businesses to explore their options would also improve the levels of innovation in resource recovery.

How will this help?

From our own experience, we know that innovation will be accelerated by collaboration and exchange of knowledge and expertise. For example, it may be possible to put together a continuous process for production of a secondary material from knowledge gained from more than one source.

Increased access to innovation facilities will widen the range of waste streams that can be treated, and increase the number of valuable resources that are available to be sold to producers, without the need for sourcing primary raw materials, thus encouraging the maturation of a secondary resource market.

How does this link up with EU policy and strategy?

A scoping study to identify potential circular economy actions, priority sectors, material flows and value chains¹ identified an insufficient investment in recycling and recovery infrastructure, innovation and technologies. A global database would largely contribute to valorise existing pilot plants and better target future investments.

The Green Action Plan for SMEs² recommends better showcasing of technologies conducive to resource efficiency in awareness raising campaigns, and closer collaborations with other EU funded initiatives for environment and climate change and it is therefore of strategic relevance for the development of synergies with those EU initiatives.

The European Institute of Innovation and Technology created a Knowledge and Innovation Community on Raw Materials with a mission to boost the competitiveness, growth, and attractiveness of the European raw materials sector via radical innovation and entrepreneurship.

¹ Scoping study to identify potential circular economy actions, priority sectors, material flows and value chains (see Further reading)

² http://ec.europa.eu/enterprise/policies/sme/public-consultation-green-action-plan/index_en.htm

Recommendation 4

SME participation is vital

Increase business participation in innovation in resource recovery

Funding opportunities for innovation exist, but SMEs are not taking full advantage of them.

What did we learn in ReNEW?

SMEs are considered the backbone of Europe's economy, driven by a need to be commercially productive. When we talked to SMEs, we found they recognised EU programmes as important funding mechanisms to support technology and business development, but felt that the programmes and application processes over-emphasize social or cooperation objectives. The application criteria are often presented in the language of these objectives, which is not necessarily a comfortable starting point for businesses. In addition, we were told that the opportunities were scattered and application processes were diverse in terms of timing, eligibility, and financing schemes. In some regions, information is not centralized because there is a wide range of organisations in charge of supporting innovation and SMEs, and so it is very time-consuming (and so discouraging) to identify the best opportunities.

Our support vouchers were successful in one region (Ireland and Northern Ireland), but not in other countries. Access to information was cited as one of the reasons for this disparity: because of the size of the region, it was easier to communicate in a productive way with prospective collaborators. The rules for our vouchers limited eligibility to SMEs. We wondered whether this was a good thing in the context of resource recovery and the circular economy.

What should be done in the future?

To increase SME involvement, EU programmes and application processes need to be consistent with the SME commercial drivers, and they need to be presented in the commercial language that SMEs understand. Funding instruments need to be written in accordance with the needs of SMEs as a starting point. Funding

should be directed toward assisting those SMEs who have established a viable business development plan.

Programmes should require SMEs to include their plan in the application (for example the supply chain, delivery technology, financing programme, and market outlets). Applicants would then apply for assistance with funding the entire development plan, but would have to break down the plan into stages, each with its own defined objectives (for example progression from concept development to bench-scale proof of concept). Funding assistance should be provided in increments orientated to each task, subject to demonstrating completion of the objectives of the previous stage. As projects mature, an increased private contribution should be required for later stages.

How will this help?

This action will contribute to accelerating innovation in SMEs. An integrated approach will facilitate SMEs to access private funding on the strength of a committed support programme, and will permit EU programmes to demonstrate substantial impact as defined by increased commercial deployments. It will lower the commitment of EU funding as support for new tasks will not be offered to projects that do not demonstrate progress through the development plan. Funding via mechanisms such as the voucher programme, would then fund task by task collaboration, provided the vouchers were used to fund the identified stage of an integrated business plan. This kind of integrated programme will result in much greater SME participation (because it is meaningful), much greater collaboration (because the collaborations being sought are in the context of the business plan requirements, not in the context of winning a funding application) and will generate much greater impact.

If we structure EU programmes in an integrated way to meet the end-to-end commercial development needs of the

SME community, then by engaging relevant research partners, process engineering services, and pilot scale facilities to meet a specific need, the communication programmes, networking events, and national contact point networks all become much more effective.

How does this link up with EU policy and strategy?

The Green Action Plan for SMEs¹ recommends closer collaborations with other EU funded initiatives for environment and climate change and it is therefore of strategic relevance for the development of synergies with those EU initiatives. In the framework of H2020 calls, all forms of innovation are covered addressing different types of activities going from research to demonstration, to market uptake, coordination and networking. It also recommends the creation of an EU-wide network of public and private investors which will be a one-stop shop matchmaking web platform for eco-innovation business projects.

The Resource Efficiency Roadmap² urges Member States, regional, and local authorities to offer information and provide incentives for SMEs which should be complemented by networking SME advice at EU level as supported through the upcoming SME green action plan. In addition to this, a recommendation highlights the need for specific mechanisms for financing resource efficiency in SMEs to be developed.

¹ http://ec.europa.eu/enterprise/policies/sme/public-consultation-green-action-plan/index_en.htm

² http://ec.europa.eu/environment/resource_efficiency/documents/erep_manifesto_and_policy_recommendations_31-03-2014.pdf

Conclusion

The ReNEW Action Plan is specifically aimed at improving innovation of resource recovery processes, in order to enhance the circular nature of the consumption of resources. We admit that this is a niche sector of the circular economy, but a vital one, at least at the start of the journey away from a linear model. Resources that are put into landfill, or used in energy recovery through incineration, are lost as materials to be used in future production, an outcome that is becoming increasingly unacceptable. Enhancing resource recovery, and keeping resources in the loops that define the concept of the circular economy will have many positive influences on our lives, and measures to accelerate the development of more resource recovery processes are therefore to be encouraged wherever possible.

In tandem with a general transformation of the way we live, it is inevitable that some resource recovery processes will become obsolete: products will not be designed the same way, made from the same materials, and even used in the same way. However, the circular economy is flexible and responsive, and we see no negative consequences to the discontinuation of processes that play a role in the start of greater progress in resource efficiency.

Equally, the timescale for the transformation to a circular economy is indeterminate, but we see no reason not to start making progress immediately. Our recommendations will help with that progress, and we urge everyone to be part of the positive changes that will result.

Further reading

ReNEW
Ellen MacArthur Foundation
EIT KIC Raw Materials
The Roadmap to a Resource Efficient Europe
Green Action Plan for SMEs
EU Waste Framework Directive
EU DG Environment Scoping Study on the Circular Economy

