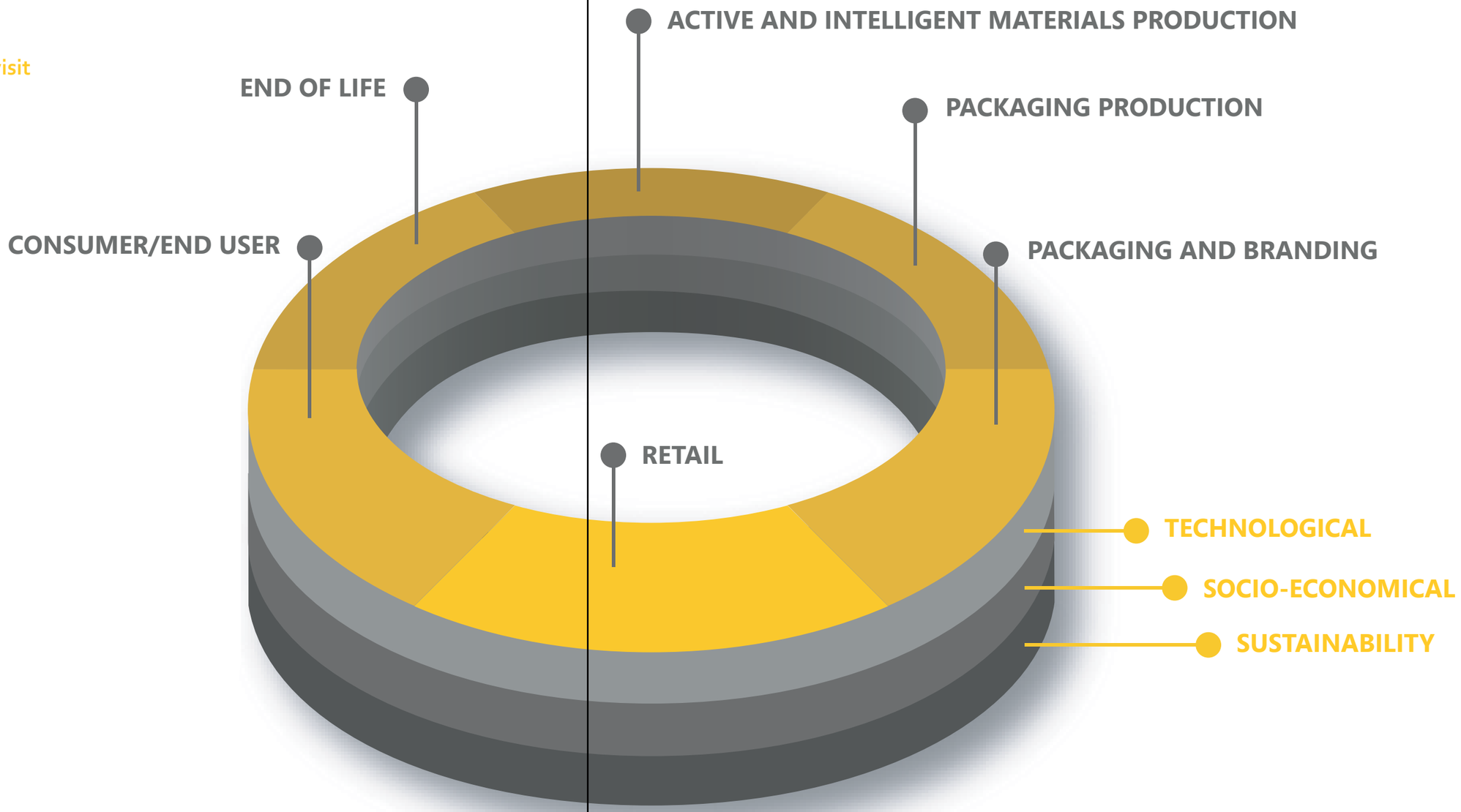
ROADMAPS
SUSTAINABILITY

Groups of researchers concentrated on developing roadmaps for three different levels of active and intelligent packaging development: Socio-economical, Technological and Sustainability.

Each of the three levels has multiple stages and concerns, tips and solutions are presented for everyone of the following: Active and Intelligent Materials, Packaging, Packaging and Branding, Retail, Consumer Behaviour, End of life.

You are currently in the Sustainability roadmap. Please visit www.actinpak.eu/roadmaps for more info.



SUSTAINABILITY CHALLENGES

A&I COMPONENT PRODUCER

- Health and safety issues of A&I components
- Reliability from sustainability perspective
- Impact assessment data availability for components

PACKAGING PRODUCER

- How additional processes required to integrate A&I components into packaging impact sustainability (higher temperatures, Surface treatment)
- Processing impact assessment data availability

PACKER/BRAND OWNER

- Interaction with food – health and safety
- Extra processing steps – environmental impacts

RETAILER

- Stability of active packaging from sustainability perspective
- Different processes in logistics
- Impact of additional investements in infrastructure from sustainability perspective

CONSUMER/END USER

- End of life
- Recyclability
- Energy recovery
- Compostability/Bioegradability
- Recovery of the active component
- Long term impact
- Environmental impact
- Impact assessment data availability

A&I COMPONENT PRODUCER

MARKET DRIVERS

- Sustainability as a market trend
- Legislation is reflecting sustainability
- Production costs of A&I are high
- Trends in increasing safety and quality of products

ENABLING TECHNOLOGIES

- LCA in its current state of methodology
- SLCA in its current state of methodology
- Lab scale research on A&I components and its interactions
- Green chemistry solutions – biobased plastics (Green-PE, Green-PET etc)

RESOURCES

- Materials producers and suppliers cooperation
- EU research grants for development of new materials
- Lobbying for clear A&I legislation
- Research into materials and processes inputs, outputs and emissions for LCA and SLCA data
- Development of new data collection standard for LCA
- Current LCA software

SOLUTIONS

SHORT-TERM

- Development of clear legislation relevant to A&I packaging and food waste
- Development of LCA methodology
- Development of impact assessment databases for more packaging materials and food products
- Development of new A&I solutions

MID-TERM

- New renewable resources development
- Optimisation of production of A&I components
- Development of Social LCA methodology
- Shift from plastic-based to bio-based solutions
- Clear EU strategy on packaging sustainability issues

LONG-TERM

- New renewable resources development
- Development of unified LCA methodology (environmental, social and economic LCA)

PACKAGING PRODUCER

MARKET DRIVERS

- Sustainability as a market trend
- Legislation is reflecting sustainability
- Packaging industry is slow in change

ENABLING TECHNOLOGIES

- LCA in its current state of methodology
- SLCA in its current state of methodology
- Lab scale research on A&I integration in packaging and its interactions
- Implementing optimisation schemes

RESOURCES

- Materials producers and suppliers processing instructions
- Machinery for applying A&I solutions in packaging
- Research of processes inputs, outputs and emissions for LCA and SLCA data of processing step
- Development of new data collection standard for LCA
- Packaging testing – food contact approval – migration, organoleptic testing
- Current LCA software

SOLUTIONS

SHORT-TERM

- Development of clear legislation relevant to A&I packaging and food waste
- Development of LCA methodology
- Use of natural based food additives – EFSA approved
- Good practice guides

MID-TERM

- Optimisation of A&I processing
- Bridge research with industry and distributors
- Development of Social LCA methodology
- Clear EU strategy on packaging sustainability issues

LONG-TERM

- New renewable resources development
- Development of unified LCA methodology (environmental, social and economic LCA)

PACKER / BRAND OWNER

MARKET DRIVERS

- Sustainability as a market trend
- Legislation is reflecting sustainability
- Trends in increasing safety and quality of products
- Personalization

ENABLING TECHNOLOGIES

- LCA in its current state of methodology
- SLCA in its current state of methodology
- Lab scale research on A&I influence on packed products
- Implementing optimisation schemes in packaging processes

RESOURCES

- Packaging machines producers and suppliers
- EU research grants for optimisation
- Research into materials and processes inputs, outputs and emissions for LCA and SLCA data for packaging step
- Development of new data collection standard for LCA
- Implementing Big Data methods and tools – analysing production
- Current LCA software

SOLUTIONS

SHORT-TERM

- Development of clear legislation relevant to A&I packaging and food safety
- Development of LCA methodology
- Development of impact assessment databases for packaging processes
- Use of biodegradable/compostable/edible materials in packaging
- Use of natural based food additives – EFSA approved

MID-TERM

- Optimisation of packaging processes
- Development of Social LCA methodology
- Shift from plastic-based to bio-based solutions
- Marketing orientation in A&I adoption

LONG-TERM

- Efficient packaging processes developed
- Development of unified LCA methodology (environmental, social and economic LCA)

RETAILER

MARKET DRIVERS

- Product losses
- Legislation is reflecting sustainability
- Packaging industry is slow in change

ENABLING TECHNOLOGIES

- LCA in its current state of methodology
- SLCA in its current state of methodology
- RFID monitoring

RESOURCES

- Lobbying for clear A&I legislation on logistics
- Research into materials and processes inputs, outputs and emissions for LCA and SLCA data for transport and logistics
- Complex combined primary/ secondary/tertiary (transport) packaging testing
- Development of new data collection standard for LCA
- Implementing Big Data methods and tools – analysing logistics
- Current LCA software

SOLUTIONS

SHORT-TERM

- Development of clear legislation relevant to A&I packaging and food waste including logistics
- Development of LCA methodology
- Development of impact assessment databases for logistic processes
- Universal benchmark of logistic options according to LCA

MID-TERM

- Development of Social LCA methodology
- Logistics monitoring technologies
- Quick quality tests

LONG-TERM

- New logistics methods
- Development of unified LCA methodology (environmental, social and economic LCA)

CONSUMER / END USER

MARKET DRIVERS

- Sustainability as a market trend
- Legislation is reflecting sustainability
- Circular economy (A-Z economies)
- Green economy (A-Z economies)
- Policy instruments

ENABLING TECHNOLOGIES

- Lab scale research on recyclability or A&I packaging and components – mechanical separation, chemical separation, physical-chemical separation)
- Compostability tests of A&I packaging (where relevant -> paper and bioplastics)
- Industry scale research on recyclability
- Reuse technologies for A&I components (especially sensors)
- LCA in its current state of methodology to compare end-of-life options
- SLCA in its current state of methodology

RESOURCES

- Lobbying for clear A&I legislation on end-of-life
- EU grants into A&I packaging end-of-life tests
- Recyclability testing
- Social media and education infrastructure (schools, universities etc.)
- Implementing Big Data methods and tools – analysing waste streams
- Biodegradability/compostability testing (where relevant)
- Current LCA software

SOLUTIONS

SHORT-TERM

- Development of clear legislation relevant to A&I packaging and food waste
- Development of LCA methodology
- Development of impact assessment databases for end-of-life processes
- Eco-design guidelines (design for recyclability and end-of-life)
- Education and information to consumers – how to use and how to dispose

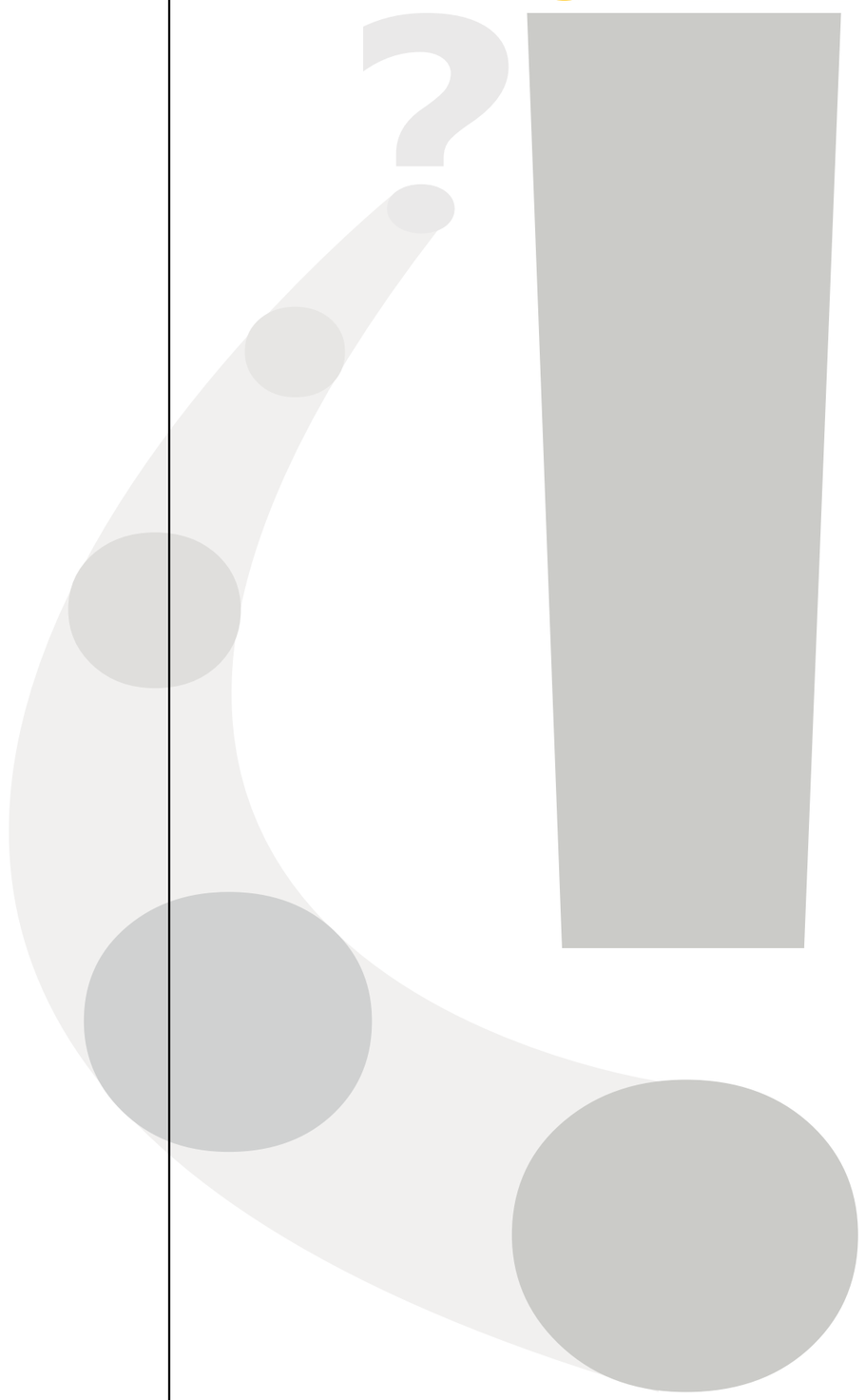
MID-TERM

- New renewable resources development
- Investment in new recycling plants – EU grants
- Development of Social LCA methodology

LONG-TERM

- Development of unified LCA methodology Development and innovation in end-of-life technologies (composting, gasification, Anaerobic digestion)

ROADMAPS
OVERVIEW



SUSTAINABILITY

	A&I COMPONENT PRODUCER	PACKAGING PRODUCER	PACKER / BRAND OWNER	RETAILER	CONSUMER / END USER
CHALLENGES	Health and Safety Reliability Impact assessment data availability	Impact of additional processes Processing impact assessment data availability	Food contact – Health and Safety Environmental impacts of processing	Stability New processes in Logistics Impact of additional investment in infrastructure	Recyclability Energy recovery Biodegradability/Compostability Recovery of A&I components Short term and long term impacts Impact assessment data availability
MARKET DRIVERS	Sustainability as a market trend Legislation is reflecting sustainability Production costs of A&I are high Trends in increasing safety and quality of products	Sustainability as a market trend Legislation is reflecting sustainability Packaging industry is slow in change	Sustainability as a market trend Legislation is reflecting sustainability Trends in increasing safety and quality of products Personalization	Product losses Legislation is reflecting sustainability Packaging industry is slow in change	Sustainability as a market trend Legislation is reflecting sustainability Circular economy (A-Z economies) Green economy (A-Z economies) Policy instruments
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RESOURCES	Materials producers and suppliers cooperation EU research grants for development of new materials Lobbying for clear A&I legislation Research into materials and processes inputs, outputs and emissions for LCA and SLCA data Development of new data collection standard for LCA Current LCA software	Materials producers and suppliers processing instructions Machinery for applying A&I solutions in packaging Research of processes inputs, outputs and emissions for LCA and SLCA data of processing step Development of new data collection standard for LCA Packaging testing – food contact approval – migration, organoleptic testing Current LCA software	Packaging machines producers and suppliers EU research grants for optimisation Research into materials and processes inputs, outputs and emissions for LCA and SLCA data for packaging step Development of new data collection standard for LCA Implementing Big Data methods and tools – analysing production Current LCA software	Lobbying for clear A&I legislation on logistics Research into materials and processes inputs, outputs and emissions for LCA and SLCA data for transport and logistics Complex combined primary/secondary/tertiary (transport) packaging testing Development of new data collection standard for LCA Implementing Big Data methods and tools – analysing logistics Current LCA software	Lobbying for clear A&I legislation on end-of-life EU grants into A&I packaging end-of-life tests Recyclability testing Social media and education infrastructure (schools, universities etc.) Implementing Big Data methods and tools – analysing waste streams Biodegradability/compostability testing (where relevant) Current LCA software

Sustainability roadmap was done with contribution of the WG2 members of the Cost Action "ActInpak" and with major contributions from

Greg Ganczewski

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COST FP1405 ActInPak aims to identify and overcome the key technical, social, economic and legislative barriers to a successful deployment of renewable fibre-based functional packaging solutions such as active and intelligent packaging. Currently, 43 countries are involved in the network, with participants representing 209 academic institutions, 35 technical centers, and 83 industrial partners.

For more information, please visit the ActInPak website: www.actinpak.eu

COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.

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