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WP 4

TASK 4.2.6: OTHER SECTORS - OTHER COUNTRIES KNOWLEDGE TRANSFERRING

DELIVERABLE 4.2.6B

OTHER SECTORS - OTHER COUNTRIES KNOWLEDGE TRANSFERRING TRANSFER PLAN GREECE

OUTPUT 4.3.8

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01. Introduction

This transfer plan aims to illustrate key-drivers, inputs and actions to facilitate and enhance the transferability of REINWASTE approach to new Countries, which were not directly concerned by the pilot actions, and to other potential sectors.

The technology transfer within REINWASTE, illustrated in WP 4.1. Methodological document, is intended as a process steered by REINWASTE partners that generates a wider awareness and ownership of REINWASTE tested solutions towards the widest possible range of SME and companies within the identified agri-food chains, and opens up for the adaptation of these solutions to new value chains or countries.

Transfer strategy, within REINWASTE, aims to support companies in their innovation processes and encourage collaboration with the research system, favouring the exchange of know-how and the creation of networking and business opportunities between Research Institutions, both on the regional and international territory, both at the regional and at the international level.

The target Countries that are concerned by the transferability plans are Bosnia Herzegovina, Greece and Slovenia.

A pool of experts in agri-food waste reduction, treatment and circular economy have been engaged to develop the present Transfer Plan covering these aspects:

1. needs and main challenges in the framework of inorganic waste minimization in their own target Country, with regard both to primary sector and food processing;
2. recommended technology transfer actions to fill the gap and support the transition towards a minor use of inorganic waste across the agri-food supply chain;
3. most relevant actors to be concerned in the transferability / technology transfer actions.

This Plan considers both primary sector and industry, focused on Greece, analyzing the current inorganic waste production and proposing transfer action to minimize it.

Transfer Plan Greece

01. Needs and main challenges in the framework of inorganic waste minimization in Greece, with regard both to primary sector and food processing

Waste Management in Greece

The per capita generation of municipal solid waste (MSW) in Greece is above the EU average, while the significant decline in the generated volumes during the 2010-2013 period is a result of the economic slowdown than the effective implementation of waste reduction programmes. The increase of the Greek GDP, from 2015 onwards, led to a gradual increase of the per capita MSW generated annually. In contrast in

the EU, the implementation of integrated waste reduction programmes led to a stabilisation of the generated per capita volumes showing a possible decoupling from economic activity (Foundation for Economic and Industrial Research - IOBE, 2020, Factsheet on Green policies in Greece)

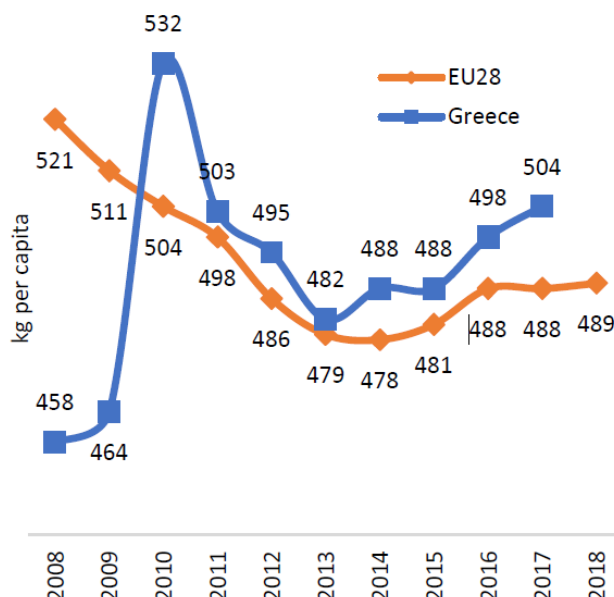


Fig 1. Per capita generation of municipal solid waste, Greece and EU28 (IOBE 2020, Source: Eurostat)

In Greece, the existing waste management system relies mostly on disposal of waste in landfills (80%), while recycling accounts only for one fifth of the collected MSW. According to the European policy, disposal in land is the least preferred waste management process and not in line with the circular economy model. Materials which would otherwise be

reintroduced into the value and production chains are disposed into the natural environment, causing environmental degradation and increasing the dependence of the economy on natural resources. Municipal waste generation has remained at the same level in recent years, being slightly above the 2017 EU average (504 kg vs around 487 kg/y/inhabitant) (see Figure 5). Very little has changed since the 2017 EIR. Greece disposes the majority of its municipal waste in landfills (80 %, vs EU average of 24 %), with only 19 % being recycled (EU average 46 %). The landfill rate has decreased modestly and the recycling rate has slightly increased.

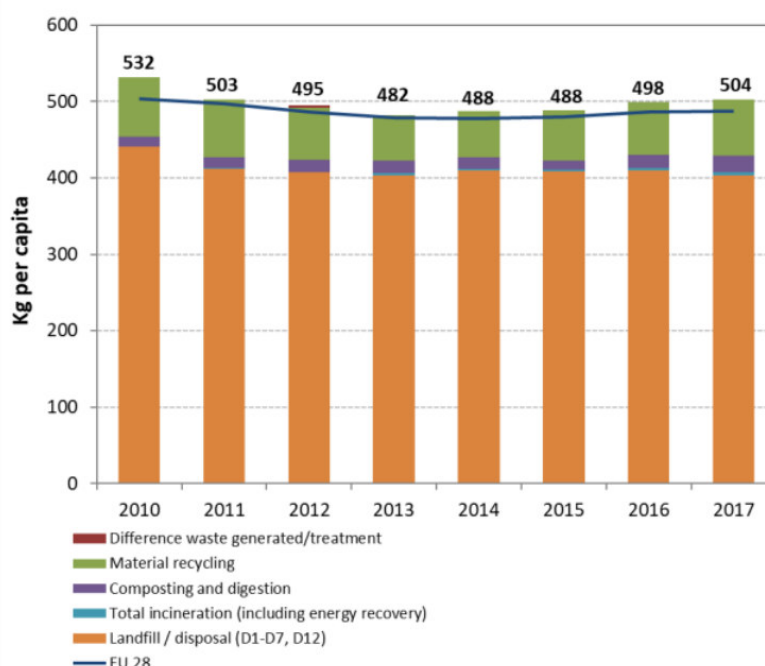


Fig 2. Municipal waste by treatment in Greece 2010- 2017 (Eurostat: [Municipal waste by waste management operations](#))

Waste management from agriculture and food industries

The majority of waste streams derive from Industry, Construction and Agriculture. Waste originating from agricultural activities have been identified worldwide as among the most hazardous and inevitable human activities producing waste:

- due to their pollutant content
- due to their spatial distribution over the cultivating areas of each region

Agricultural waste may reach up to 40% of the total country waste. In Greece we have 4.7 mil tn/year (EU(28): 57.7 mil tn/year).

Each waste is fully identified by a six-digit code. The first two numbers identify the source that produces the waste, from 01-20. Code 02 is "Waste from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing". Then the four-digit number that classifies the activities in different chapters and the six-digit number that identifies the waste are identified. Category 02 includes the following:

- 02 01 04 plastic wastes (excluding packaging)
- 02 01 08 agrochemicals containing dangerous substances

- Agrochemicals other than 02 01 08

Waste production from agricultural sources by 2030 is considered to follow the corresponding rate of change of the country's real GDP (real GDP). Taking into account the evolution of real GDP as well as the quantity of waste production from agricultural sources produced for the year 2018, which amounts to 12,469,086 tons, is calculated in the table below the production of waste production from agricultural sources for the years 2025 and 2030

Table 1. Evolution of waste production from agricultural sources till 2030 (Source: National Waste Management Plan, 2020)

Source	2018	2020	2025	2030
Crop residues (t)	2.297.336	2.200.526	2.418.190	2.528.985
Withdrawal fruits and vegetables (t)	129.138	123.696	135.931	142.459
Livestock wastes (t)	10.033.312	9.610.508	10.561.127	11.045.010
Empty pesticides and fertilizers packaging (t)	800	800	879	919
Agricultural plastics (t)	8.500	8.500	9.341	9.769
Total wastes (t)	12.469.086	11.944.030	12.125.468	13.726.842

Plastics and Single use plastics

According to Eurostat, the total quantities of plastic waste in 2016 amounted to 257k tonnes, falling by about 65% compared to 2006 (755k tonnes). In 2017, plastic packaging waste was estimated at 188k tonnes, of which approximately 78k tonnes were recycled, i.e. around 41.4%. Single use plastics will be banned following the EU directive 2019/904 and the Ministry of Environment and Energy is considering an early adoption of this measure by July 2020. As part of the National Strategic Waste Prevention Plan, Greece introduced an environmental fee on plastic lightweight carrier bags (thickness of 15-50µm), which since 2019 is set at 7 eurocents per bag. These measures led to the reduction of the consumption of lightweight bags by 80% in 2018. However, the introduction of plastic bags of thickness 50- 70µm, which are exempted from the environmental fee and therefore costing less affected the consumers behaviour. The new environmental law of 4685/2020 (May 2020) expanded the use of the environmental fee in all plastic bags.

The use of plastics in agriculture is widespread: they are used for crop protection and shading, soil mashing, irrigation pipes, silage coating, harvesting and post-harvest work, tanks, trays and containers for seedlings, packaging and bags. Currently, it is estimated that only 10% of agricultural plastics are recycled internationally. Films from agricultural production, greenhouses construction, trash bags, labels, irrigation pipes, PPE etc.

- PE (LD-HD) is primarily used for agricultural applications.
- LDPE 60% (>500.000 tn/year in the EU)
- Fertilizers are also packaged in special sacks that are usually composed of LDPE, HDPE or polypropylene (PP).

If correctly collected, can be used as a new raw material or as an alternative fuel for energy recovery (ASF)

Affecting factors for recycling	Affecting factors for energy recovery as ASF
• Quality vs recyclability • Inert contaminants (soil, sand etc), • Thickness • Co-mingled plastics (contamination of the material with • other types of plastics), • Additives-pigments (not recyclable/low resell value), • Ageing • pesticides residues, • organic matter contamination.	• Cl and S content, • Heavy metals, • Volatiles, • Moisture, • Physical properties, • Calorific value, • Quantity of ashes



Fig.3. Agricultural plastics wastes

Table 2. Main use of plastic materials in Greek agriculture (Data from [Plastika Kritis S.A](#))

Application	Quantity, thickness, time of use	Areas with the largest concentration
Greenhouse covers	3000 MT/year, 150-180µm, 7 years	Crete, West Peloponissos, Preveza, Hmathia, Attica
Cover of vineyards and tobacco fields	600 MT/year, 120-200 µm. Use 1-2 years in tobacco, 7-8 years in	Korinthos. Thrace, Crete, West Macedonia, Aitolokarnanis

	vineyards	
Silage	500 MT/year, 120-150 µm, 1 year 500 MT stretch 25 µm, 6 months	Various livestock areas in Greece
Soil disinfection	600 MT/year, 30-40 µm, 1-2 years	Crete, West Peloponnissos
Crop covering	1500 MT/year, 17-50 µm, 1 season	West Peloponnissos, Thessaly
Soil covering	1800 MT/year, 15-60 µm, 1 season (3 years)	West Peloponnissos, Thessaly

*based on data from Plastika Kritis S.A

Pollution from agricultural plastics is one of the biggest challenges in Greece as well. The situation in the country is characterized by deficiencies in the recording of quantities produced and used, while the predominant management practices are dumping in the ground and incineration in the countryside and the remaining waste ends up in landfills. In 2020, through the "New Agriculture for the Young Generation" program, a national effort was launched for the responsible management of waste from agricultural plastics. Aims of this program are:

- supporting young farmers to ensure their future business competitiveness by adopting sound management practices,
- the greatest possible contribution of the agricultural sector, as part of the solution for the environment

The current situation in the management of plastics in agriculture in Greece is characterized by deficiencies in the recording of the quantities produced, with the disposal in the soil and the open combustion is the predominant management practice. Inadequate management is also recorded for waste of agricultural origin of non-organic composition, such as plastic greenhouses, fertilizer and pesticide packaging.

Although from 2015, through the National Waste Management Plan (NWMP), specific targets were set per stream of waste and for the stream agricultural waste, today they have not been achieved:

- Separate collection and recovery of plastics of agricultural origin with emphasis on greenhouse plastics and packaging waste.
- Separate collection and proper management of pesticide packaging waste containing hazardous substances through alternative management systems. Provision for incentive to pre-sort plastic / biodegradable agricultural waste e.g. in exchange for organic fertilizers and soil conditioners.

Possible areas of improvement on waste management from plastics from agriculture

As pointed out from Kikrilis (2019) ⁽¹⁾ greenhouse cover leaf for vineyards in areas of high concentration

is feasible and takes place in large degree in Crete. There are already collection stations in Ierapetra, Tympaki Paliochora and Falasarna. The intention of Plastika Kritis is to organize in cooperation with local actors, collection stations in Marathon, Manolada Trifylia, Preveza, Trikala and Imathia. The collection of plastics used for silage seems to be impossible due to their very large dispersion of livestock farms and the very small quantity per holding.

There is difficulty in management of thin sheets (linear coverage, soil disinfection sheets and thermal curtains). There are no recycling units for thin sheets because their recycling is not-economical due to its very small thickness and very high content of soil and humidity after their use. Internationally, recycling of such sheets has also failed. The use of biodegradable materials, though successfully tested, is deterrent due to the high extra cost 41 € / acre and prevents them farmers since its adoption.

Possible/viable solutions for the sustainable management are:

- Collection and landfill (Creation of collection stations in the regions of Peloponnese and Thessaly where farmers will deliver the plastics themselves after their use and will be baled)
- Controlled combustion with parallel energy recovery (i.e cement industry).

Briassoulis and Hiskakis M ⁽²⁾ present the outcomes of a European research project (LabelAgriwaste: Labelling agricultural plastic waste for valorizing the waste stream) aimed to develop standard procedures and integrated methodologies for labeling the flows of all agricultural plastic waste (except agricultural) to managing them towards the best possible alternative treatment and utilizing them with priority in the recovery of materials

¹ Manolis Kykrilis, 2019. Solutions for the management of agricultural plastic sheets after their useful lifetime. The experience of Plastika Kritis S.A. Proceedings from the conference "Plastic use in agriculture", New agriculture for the new generation, Athens, 2019

² Briassoulis D. and Hiskakis M., 2019. Management and Utilization System for agricultural plastic wastes. Proceedings from the conference "Plastic use in agriculture", New agriculture for the new generation, Athens, 2019

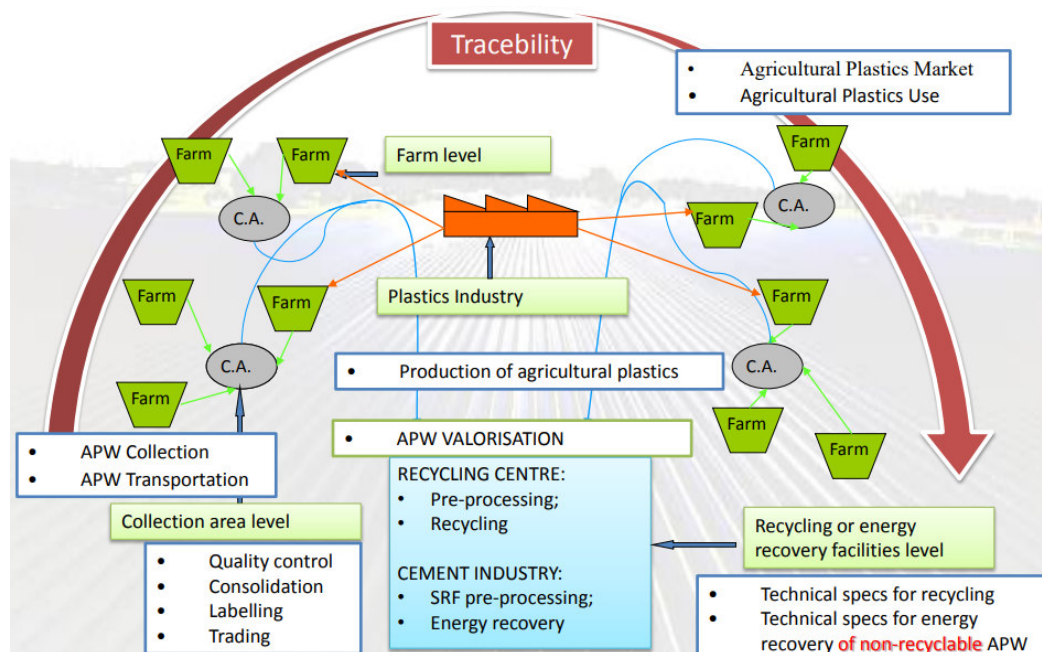


Fig. 4. The LabelAgriwaste concept

The key actions of the project were:

- Traceability from the level of agricultural producers / importers plastics and suppliers, farmers, gathering places and in the final disposal of homogeneous, compressed and labeled (labeled) agricultural plastics
- Labeling of agricultural plastic waste covers the entire life cycle of agricultural plastics as well as recommended or possible alternatives for their utilization
- Technical instructions for use, collection, transport, and management - utilization of plastic wastes
- Financial scheme which includes fees and reciprocal benefits, revenue and expenditure and is controlled by a national body in close cooperation with all stakeholders and supervision of Ministry of Agriculture and Ministry of Development
- Implement the current European legislative framework with a view to preventing its mismanagement and burden practices environment, products and public health

Empty pesticides and fertilizers packaging

This category includes packaging materials for fertilizers, agrochemicals and veterinary medicines. As regards empty packages of fertilizers, agrochemicals, veterinary drugs, as well as greenhouse plastics although according to the code of good agricultural practice they should be collected and properly managed and should not be left in the crops or in public areas, however, the usual agricultural practice, with a few exceptions, is on-site incineration, along with agricultural residues, which emit significant amounts of smoke and dust as well as nitrogen oxides (NOX), carbon monoxide (CO₂) and hydrocarbons. The containers used for pesticides may still have residues of the included formulation after use (2-5 % of the total amount)

- Common practices up to day include ⁽³⁾:

³ G. Pavlidis, H. Karasali, M.K. Doula, E. Ploumistou, D. Malamis, K. Moustakas, 2018. Hazardous agricultural waste in Greece: Current status and future perspectives. 6th International Conference on Sustainable Solid Waste Management, Naxos, June 2018

- Disposal in the field, dumpsites or with MSW
- Disposal near irrigation ditches or in well
- Uncontrolled burning or burying
- Collection for reselling (Mainly for larger containers/barrels/tanks)
- Collection for re-use (i.e storage of water etc.) / Mainly for barrels and larger tanks

At the same rationale, fertilizers packaging is commonly disposed in the field/dumpsites, with MSW, near irrigation ditches, burned or re-used, e.g. for collecting and transferring seeds and harvested crops. Residues are still present as dust or granules



Fig.5. Wastes from Empty pesticides and fertilizers packaging (G. Pavlidis et al., 2018)

Empty pesticides containers

In recent years, following the principles of circular economy and environmental protection significant efforts were made from governments, research institutes, pesticides companies and their national and EU associations, and local communities to initiate management schemes mainly via EU funded research projects (LIFE+, INTERREG, INTERREG-MED). Main outcome of these projects is that there is a huge potential for recycling as well as for energy recovery (G. Pavlidis et al., 2018).

Problem:	Unknown composition (mixed bottles of different active substances PPPs) and pollutant concentration/variable plastic types/no established collection system
Solution	triple rinsing (FAO 2008)/pressure rinsing/integrated pressure rinsing and physical damage. The method has 99% cleaning efficiency

An analysis of each batch before valorization and classification to end uses according to the “product” quality/thermal treatment before valorization is needed. Farmers training for the rational use of empty containers is another critical issue that should be handled. In Greece, The Laboratory of Chemical Control of Pesticides (Benaki Phytopathological Institute-BPI) is the designated national laboratory for the control of all PPP and biocides formulation, residues in soil and other matrices as well as the pesticides

containers. BPI collaborates with national and international organizations and companies for this scope. From the analysis of extended series of empty containers between 2012-2017, from random samplings throughout Greece as well as other countries of the EU it was shown that 97% of farmers rinse the empty containers to clean it and 8/10 PPPs users performed successful triple rinsing, thus the container was suitable for further valorization

Expired, illegal or inappropriate plastic pesticides products (PPP)

When a product's approval has been withdrawn or amended (for commercial, safety or other reasons), or if the product batch has been considered as inappropriate for market or the product's expiration date is passed it shall be dealt as 'hazardous waste'. The pesticide shall be handled as hazardous material. Its container may be recycled after the necessary cleaning



Fig.6. Expired, illegal or inappropriate PPP (G. Pavlidis et al., 2018)

The packages are not rinsed and thrown next to the place uncontrollably - rarely there are bins- while and maybe the municipality will collect them later along with the other garbage, with as a result they end up being buried together with the urban ones in landfills or landfills polluting groundwater or burning in barrels on site. The burning of empty plastic bottles containing plant protection products releases toxic substances such as furans, aromatic hydrocarbons, dioxins and suspended particles (from drug residues and packaging materials). In addition, pesticide residues pollute the aquifer posing a significant risk to human health and the environment. Another bad practice is to use empty packaging for purposes other than the user himself, without regard to the dangerousness of the situation, as tool cases or even pet feeders ⁽⁴⁾

Polyecogroup in collaboration with the Municipality of Komotini has initiative and implement a sustainable and environmentally friendly action plan for the proper management of empty pesticides containers. Their plan is based on the following elements (Karakolis Giannis, 2019):

⁴ Karakolis Giannis (Polyecogroup), 2019. Management of vacuum contaminants pesticide packaging. Proceedings from the conference "Plastic use in agriculture", New agriculture for the new generation

- Municipality, has installed special bins in various places within its geographical boundaries
- They managed about 32t of contaminated packaging with pesticides within 5 years.
- They undertook the repackaging of the waste to specialists UN-certified bags, collection, transport and their utilization in our licensed facilities
- Upon receipt of the waste, a Certificate is issued Receipt by which, in accordance with applicable law,
- Polycogroup becomes the main and obligated management body for their further elaboration and utilization.
- The contaminated packages after undergoing the appropriate processing at our facility, shipped to co-incineration (R) in cement factories within the country (energy utilization)
- The Waste Cycle closes completely and is complete traceability with Text Identification Form Legislation as well as the HMA (Electronic Waste Register)



Fig.7. Non proper management of empty pesticides containers (Karakolis Giannis, 2019)



Fig.8. Proper management of empty pesticides containers (Karakolis Giannis, 2019)

Briassoulis and Hiskakis ⁽⁵⁾ present as a good practice the results and concept of a research project (AgroChePack: Design of a common agrochemical plastic packaging waste

⁵ Briassoulis D. and Hiskakis M., 2019. Design of a European agrochemical plastic packaging management scheme. Proceedings from the conference "Plastic use in agriculture", New agriculture for the new generation, Athens, 2019

management scheme to protect natural resources in synergy with agricultural plastic waste valorization) which aimed at designing an environmental friendly and economically viable management scheme for Agricultural Plastic Packaging Waste (APPW) by transferring know-how from existing schemes, by identifying problems and bottlenecks faced by existing schemes in Europe and by designing and implementing effective pilot schemes in Greece, Cyprus and Italy. The project develops in four phases:

- Record & analysis of current situation scheme: Map APPW related agricultural activities, existing schemes and legal framework in participating regions. Establish reverse logistics of agrochemical packaging for continuous updating and traceability.
- Design of APPW management: Design APPW management scheme based on specifications and guidelines of LabelAgriWaste adapted to technical and financial parameters of participating regions and potential improvements and compatibility adaptations of existing schemes in France and Spain. Design pilot stations with supporting technical and legal elements, as applicable.
- Pilot scheme implementation: Establishment of pilot stations, training of farmers, pilot tests on management of APPW, sampling, analysis, quantification and evaluation of results, optimisation and finalisation of APPW scheme.
- Dissemination of the project results: Dissemination activities and training sessions for local authorities, farmers and organisations, national services and consumers and local communities on implementing proposed APPW management.

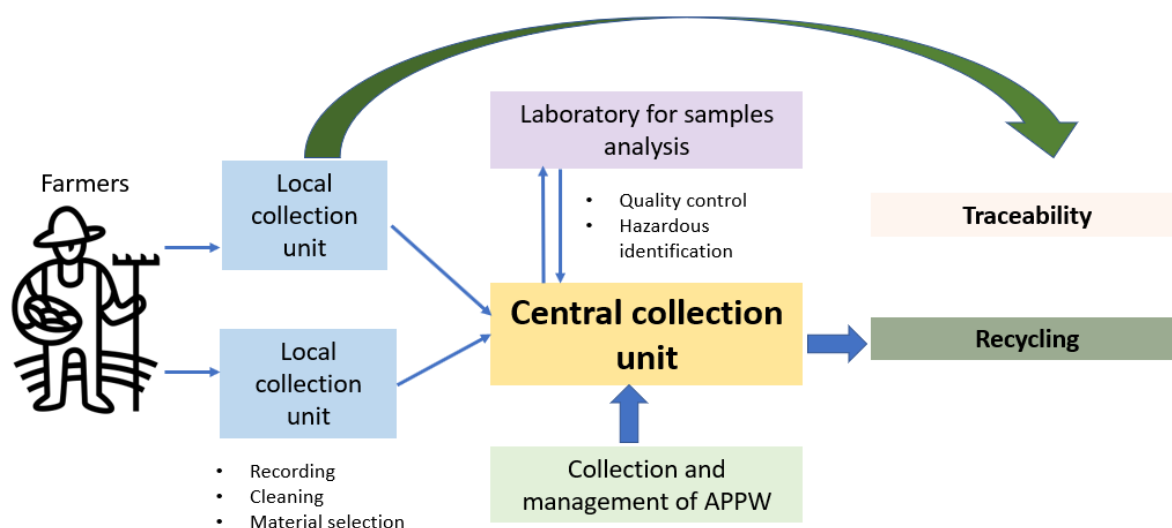


Fig. 9. The AgroChePack concept for economically viable management scheme for Agricultural Plastic Packaging Waste (Briassoulis and Hiskakis, 2019)



Situation before the implementation of AgroChePack concept



Collection Unit



Recycling

Fig. 10. Agricultural Plastic Packaging Waste management before the implementation of the AgroChePack concept. Collection unit and recycling of APPW during the implementation of the project (Briassoulis and Hiskakis, 2019)

02. Recommended technology transfer actions to fill the gaps and support the transition towards a minor use of inorganic waste across the agri-food supply chain

Greece has yet to advance in terms of integrated waste management compared to the rest of EU27. Municipal solid waste (MSW) management still relies mainly on disposal in landfills (80%). Around 15% of the collected MSW are being recycled, while 4.1% is composted. As a result, the country ranks very low in EU27 in terms of circularity of the economy. The timely implementation of the National Strategy for Circular Economy is a necessary step towards increasing circularity and reducing waste landfilled. Core strategic policy documents are currently being revised.

As shown in Figure 11, Greece is at risk of not achieving the target of 50 % municipal waste recycling by 2020. The Commission has therefore published an ‘early warning report’¹⁵ for Greece, setting out specific priority actions to bridge the implementation gap. Greece must also make a significant effort to comply with the post2020 recycling targets ⁽⁶⁾

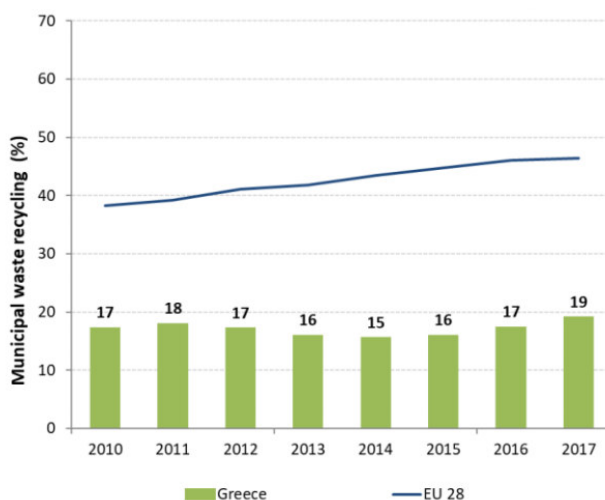


Fig. 11. Recycling rate of municipal waste in 2010- 2017 (Eurostat, [Recycling rate of municipal waste](#))

Additional measures need to be taken to divert biodegradable waste from landfills and to put in place and monitor infrastructure and schemes for door-to-door separate collection. Incentive systems favouring prevention and participation to separate collection (PAYT schemes) do not yet exist, while specific incentives for local authorities to develop separate collection are under development. On the positive side, Greece has made legal and practical progress in increasing waste recycling and expanding its EPR schemes. For

⁶ Directive (EU) 2018/851, Directive (EU) 2018/852, Directive (EU) 2018/850 and Directive (EU) 2018/849 amend the previous waste legislation and set more ambitious recycling targets for the period up to 2035. These targets will be taken into consideration to assess progress in future Environmental Implementation Reports.

example, it has reduced waste disposal to non-compliant landfills. In 2015, this dropped to less than 4 % of the total waste disposed. An operational plan for EPR, which will introduce funding for different EPR packaging schemes, is about to be applied. The local (municipal) waste management plans, which have been incorporated in the regional plans, set the separate collection of bio-waste as a basic goal. Greece has planned to allocate a large proportion of EU funds to waste management measures and infrastructure – integrated waste treatment facilities and source separation schemes, in particular. However, there are doubts on whether spending on residual waste treatment at the lower levels of the waste hierarchy is too high compared to spending on infrastructure. Care must be taken not to move from landfilling to poor quality Mechanical and Biological Treatment installations (49 MBTs are currently foreseen)

Priority actions ⁽⁷⁾

Stream-specific national strategy: Industrial Waste

- Re-use and recovery are prioritized if industrial waste cannot be directly used in production processes, without entering the waste management system
- Reinforcement of synergies among industrial sectors aiming at industrial symbiosis
- Forbidding the mix of hazardous waste with non-hazardous industrial waste

Stream-specific national objectives: Industrial Waste

- Ensure traceability of industrial waste at all stages from generation to final recovery/ disposal
- Ensure rational management of industrial waste along the lines of the waste hierarchy and taking into account sector-specific best available techniques
- Development of an electronic platform for promoting synergies among industries
- Establishment of adequate national network of installations for the disposal of industrial waste
- Implementation of systematic research in order to upgrade industrial waste management methods and documentation of the best available management option from the operators of the industrial facilities

Infrastructure networks for industrial waste recovery

- the full utilisation of existing infrastructure available from the industrial and construction sectors to recover non hazardous inorganic waste
- the development of synergies among industrial sectors, including the waste management sector, especially in regards to recycling and recovery of non-hazardous organic residues
- the production of secondary materials and fuel from industrial waste
- the maximisation of recovery options, such as backfilling and land treatment which results in agricultural or ecological benefit

Infrastructure networks for industrial waste disposal

- private waste disposal facilities to serve own needs for those producers which have to dispose of more than 50 thousand tonnes annually

⁷ D. Kallidromitou, K. Korizi, K. Aravossis, 2019. Industrial Waste Strategy for Greece

- landfills for non-hazardous industrial waste; co-disposal with MSW for similar types of industrial waste, where feasible; co-siting with MSW landfills where possible
- separate landfills for non-hazardous inorganic industrial waste; co-siting with inert waste landfills, where possible
- utilization of existing hazardous waste landfills to cover the current and short-term needs for hazardous waste disposal
- at least one landfill for hazardous industrial waste
- exploration of co-disposal possibilities and sea transport arrangements to cover the needs of the islands
- utilization of the existing industrial installations for the (co)incineration of organic industrial waste that cannot be recovered

Organisational and other measures

- An electronic platform for promoting synergies among industrial sectors to maximise recovery operations
- Voluntary industrial waste management plans drawn up by operators of industrial facilities
- Organisation and supervision of waste management within officially designated industrial areas
- Inspection programme and rationalisation of management for historically accumulated industrial waste
- Development of standards for the use of inorganic wastes of industrial origin as secondary materials
- Preparation of guidance documents on the interpretation and implementation of the European List of Waste (Commission Decision 2000/532/EC, as amended) from the Greek competent authorities and other actors involved in the generation and management of industrial waste
- Procedural arrangements for the definition of by-products and end-of-waste status
- Awareness and education programmes and campaigns for industrial waste

Actions from the Ministry of Environment

The key priority targets of the New NWMP centre around the re-allocation of waste management to a municipal level, placing the responsibility for separation at source and recycling on the municipalities through small-scale units, the encouragement of community participation, the targeting of advanced waste management techniques and, as an overarching principle, maintaining the public nature of waste management. The consequences are, according to the plan, reduced costs, local communities reaping the profits from waste management through appropriate financial incentives and up to 16,000 new jobs, presumably most of those in the public sector. Alternative waste management, currently almost entirely privately-run, will also be brought under public control ⁽⁸⁾.

⁸ Watson Farley & Williams, 2015. The new Greek national waste management plan

According to the New NWMP which is supplementary to the National Waste Prevention Strategic Plan, the national policy on waste management is oriented to the following targets for 2020

- the generation of waste per capita to be reduced drastically;
- 50% of the aggregate Municipal Solid Waste (“MSW”) to be prepared for re-use and to be recycled through separate collection of recyclables and bio-waste;
- the recovery of energy to act as a complementary treatment option when all other recovery options will have been exhausted;
- landfill to constitute only the final treatment option and to be limited to less than 30% of aggregate MSW quantities.

The New NWMP sets out the following strategies for the implementation of the national waste management policy (9):

- Establishing an integrated waste management planning framework through a national strategic waste prevention plan, national special waste management plans for specific waste streams
- Ensuring a high protection of environment and human health through - among others - the enhancement/development of a central mechanism for the registration and processing of data in relation to the generation and management of waste to ensure traceability from production to final destination, the development of appropriate infrastructure network for the recovery and disposal of waste, the rehabilitation of contaminated waste disposal sites, the enhancement of controls/inspections and enforcement mechanisms in order to ensure compliance with the laws
- Implementation of Separation at Source, as the most appropriate means of collection, with the aim to achieve high quality recycling through - among others - the establishment of separate collection of waste materials (at least paper, metal, plastic and glass) throughout the whole country in order to achieve by 2020 the target of recycling of at least 60% by weight, the establishment of the separate collection of bio-waste in order to achieve by 2020 the target of separate collection of 40% by weight, the proper treatment of bio-waste in order to produce compost which meets quality criteria so as to be able to be used further in accordance with international and/or national standards
- Rationalisation of waste management utility costs and promotion of economically and environmentally viable investments in order to provide contributory benefits to local communities from recycling
- Energy Recovery in the form of practices with low environmental impact which produce (based on biological and/or chemical procedures) secondary gas or liquid fuels for the generation of energy. Such practices include the recovery of biogas from landfills, the generation of biogas through anaerobic digestion, the generation of biogas from waste oils etc

Main actions of the new NWMP of Greece (adopted by the Greek Parliament on 29/09/2020) (9):

⁹ Liogkas Vasileios, 2019. Greek National Strategy and Operation Plan 2018-19 National Commission on Circular Economy Institutional setting, main challenges for the future. Joint Meeting of MS groups on IPP-SCP & resource efficiency, Brussels, 2019

- Introduction of national targets for the promotion of biowaste separate collection: 5%(w/w) by 2015, 40%(w/w) by 2020 (National Waste Management Plan)
- Preparation & distribution to all stakeholders of the “Guide for biowaste management practices”
- Preparation & distribution to beneficiaries of the “Technical guidelines for the design of composting plants-tender documents”
- Preparation & distribution of the “Guide for Composting Plant operation”.
- Development of specifications of various types of compost for market promotion
- New Recycling Law was established. Separate collection. Incentives to Municipalities and citizens are set by new Law for waste management bodies framework.
- Legislative framework for the municipal “Green Points” (separate collection of 4 streams of packaging, green waste and others) was established.
- Legislation for the plastic bags led to 70% reduction of consumption.

Since September 2019, the implementation of the National Strategy is supported by the LIFE program, the EU funding instrument for the environment and climate action. The LIFE Integrated project “IP Circular Economy in Greece” is an 8-year project of €16 million total budget (60% EC contribution) that will support the country in the implementation of the National Strategy for Circular economy and other key strategies (National Waste Management Plan, National Strategic Plan for Waste Prevention, National Action Plan for Circular Economy). The main objective of the LIFE-IP CEI Greece project is to reduce the amount of municipal waste sent to landfill and to promote waste prevention and re-use, based on circular economy principles (The LIFE program, 2019). During its lifetime, the project foresees mobilization of €800 million in complementary national and European funding. Despite the national waste management plan’s ambitious goal to reach a bio-waste recycling rate of 40 %, reaching more than 8-10 % by 2020 seems unlikely, especially without adequate treatment infrastructure

03. Most relevant actors to be concerned in the transferability / technology transfer actions

The transfer actions should involve a large number of stakeholders since all can contribute to a transition of the agri-food value chains.

Governmental

- Ministry of Environment
- Ministry of Rural Development and Food
- Ministry of Development
- Regional Units for
- Regional Associations of Solid Waste Management Agencies
- Central Union of Municipalities (KEDE)
- Association of Greek Regions (ENPE)
- National Organization of Recycling (ε.ο.αυ)

Academic - Research organizations

- Agricultural University of Athens
- Benakeio Phytopathological Institute
- Demokritos Research Centre
- Aristotle University of Thessaloniki
- National Technical University of Greece

Stakeholders - Industries

- Plastika Kritis S.A
- Polyecogroup
- Federation of Greek Food Industries (SEVT)
- Federation of Greek Industries (SEV)
- PPC S.A (ΔΕΗ)
- VA.STE.ECO Evolution Ltd
- Recycling Sorting Center (RSC)
- Recyclable Materials Collection Center (KDAY)
- Lafrage

Associations - Unions

- Hellenic Solid Waste Management Association
- GEOTTE (Geotechnical Chamber Union of Greece)
- TEE (Technical Chamber of Greece)
- Hellenic Recovery Recycling Cooperation
- Association of Hellenic Chemical Industries

NGOs

- Pandoiko
- FoDSa Network (ΦΟΣΔΑ)