GrEAT
Green Education for Active Talents

INTELLECTUAL OUTPUT 2
TRAINING MODULES AND MATERIALS

Waste management

Co-funded by the Erasmus+ programme of the European Union.

INDEX

CHAPTER 1: TOPIC FRAME

Introduction

We live in a “one time use” society, that produces, consumes and wastes.

Let’s think that we commonly measure the development and wellness of a National State through the Gross Domestic Product (GDP) index, that measures the whole economic value of the goods produced in that country. If it happens that the GDP remains under 2% for some consecutive years we start talking about stagnation: there is an economical crisis. But an increase of 2% per year of the GDP means to double the goods produced in less than 40 years! And, of course, a more then proportional production of wastes (we need to consider the packaging too)

We have many options to fight this waste problem, each one with specific merits and defects in terms of effectiveness, efficiency and impacts on environment and health. We can choose among a range of possibilities, none of which is “The” solution, finding the best compromise and keeping the door open to possible evolutions of the sector. It is, indeed, to have a comprehensive approach to the waste problem, considering each phase as a crucial part of a unique process.

This approach is named integrated waste management, that is the management of the whole waste chain since they are produced (or even though…) to the end point of their life cycle (where wastes are transformed in new resources or definitively disposed), in these days widely preferred over the management of the single phases (collection, recovery/treatment and disposal).

In conclusion, the integrated waste management is the totality of the activities that optimize the waste disposal, making it the most effective possible (about the reduction of wastes of energy and natural resources) and also safer for environment and health. The integrated management foresees a unique brain that projects the entire system, its phases and technical and organizational options, keeping in mind from the beginning what to do about the waste: what can be recovered, how much can be reused, where to dispose what’s left and cannot be recycled.

Historical picture

In nature, the refuse of the vital process – the animal excreta – come back to the cycle. The human communities, for a long time, made the same; even if since ancient times the big cities, starting from Rome, felt the need to arrange systems that allow to evacuate wastes without compromising health, while in the Middle Age the accumulation of inert debris determined everywhere the rise of the street level. Still in the XIX Century, the wastes problem in the cities regards quite only human and animal excreta. With the industrialization the solid wastes question starts to be present, but it is the important demographic growth after the Second World War that wastes really invade cities and become a visible problem. At that time, outside the cities it is plenty of free space and the most immediate solution is the creation of landfills, often inside empty caves.

This cannot be a permanent solution, because the quantities are constantly increasing, while the enlargement of cities makes rarer the spaces where “parking” wastes. In this period, the beginning of the 60s, some cities of big dimension start to consider the solution of incineration.

In the late 80s an alternative model starts to emerge, thanks to many ingredients. First of all the principle of responsibility of the producer, that says the companies that design, produce and deliver the goods on the market have to take care also of the disposal of the waste. As a consequences, we see the birth of recovery systems for packaging, exhausted oils and electrical materials. After that, the plants are not any more the destination point of the entire waste, but just of the fraction remaining after the operations of collection, selection and recovery. The chain becomes longer and more complex, manage the waste is not any more done in a few and standardized phases, but a set of collection and treatment activities, specific for each material, made by specialized operators, connected in a network of intermediation, logistics and recovery.

With the strong support of the European Union legal frame, the integrated waste management imposes itself, with new protagonists next to the public authority, companies that consider waste as a new business field. Also the general approach to the question evolves from urban hygiene to environmental policy. Finally, also the relationships with citizens is upset: he is now considered an active subject that has to correctly separate wastes inside his house and make better consumption choices, paying particular attention to the amount of packaging while purchasing.

Waste and society

Wastes have characteristics that make unpleasant having to deal with them. They are something we want to get rid of, transferring the problem to someone else or on an impersonal entity (the environment); it is something that back to a few year ago was treated during the night and without the involvement of citizens.

But wastes are actually a problem that concerns the hearth of every day life, a contradiction: the growth of economical and material wellness produces also major wastes and environmental damages and, in the end, malaise. The controversial relationship between economic development and production of wastes stress out that we are talking about deep matters of the contemporary way of living. It is not only about introducing recycling, select paper and glass at home, but discuss consolidated life styles, practice hard every day behaviours, try to reorient the whole economic system. Wastes are indeed the last ring of a long chain of every day practices.

The first step for a better behaviour is to always ask ourselves how the goods and services we buy are produced, if we really need them, what is the impact of their use and disposal. To awareness it has to follow a concrete action, about the reduction of quantities and the rationalization of uses, possible thanks to strong inspirations: the respect for environment, the will to preserve it for the next generations, the value of the job, the judgement of people for what they are and not for what they have. These values are shared among the communities but they need to be connected with real actions promoted in a first place by education subjects: schools, environmental education centres, associations, parishes, public agencies…

On the other hand, the philosophy of waste resists and is associated to luxury, power, nonconformity…whit the mainstream cultural models that picture the environmentalism as a looser, frugal and hidebound choice.

A second field of clash is the one connected to the reactions emerging in any territory when occurs the possibility of construction of a plant for waste disposal, such as a new landfill or incinerator or biogas plant. These reactions are undoubtedly motivated, as any plant for the waste management generates emissions, but there isn't the same vehemence for other activities, even more polluting.

In the past years this kind of popular reaction was named NIMBY syndrome (Not In My Back Yard), meaning the attitude of who doesn't want a dialogue and refuses without discussing the opportunity of hosting a plant that is useful for the entire community.

The only way to overcome those conflicts and oppositions is sharing the responsibility and feel to belong to a community. Wastes are a problem that involves everyone, the solution of which brings sacrifices and advantages to be shared, actions that need a mutual trust and the commitment of every actor: the local bodies, that have to share data and information and be ready to dialogue with citizens; the producers, that have to design products already thinking to recycle and have to take charge of some disposal expenses; citizens, that have to embrace more green life styles and be open to discuss new solutions.

Other important actors are the associations and NGOs: their main role is to report the crimes and the bad things connected to the environment, but they also have and educational job, both for students and adult citizens. The social cooperatives, that have the main goal to bring in the job market disadvantaged people, work often in the fields of recovery and recycling. Their involvement in the waste sector made someone talk about a triple advantage: an activity that generates income (first advantage, economic) increases the quality of environment (second advantage, environmental) and opens a door in the job market for people with strong difficulties (third advantage, social).

Behaviours to be changed

As it has been demonstrated by sociologists and behavioural psychologists, each person shows identity also through the consumptions, especially through the material goods bought and used.

This process involves also the disposal of the good, because no more representative of someone identity, not trendy anymore or useless. This attitude is shaped also by economic and educational factors, such as the budget or the attitude to recycle and reuse.

The stimulation of more life styles is complicated: our identity is connected to what we buy and at present the life cycle of a good is every day shorter, tank to the continuous realization of new products and new versions. So, the use of not brand new products, or even recycled or reused ones, sometimes recalls to social isolation. In this picture, not only wastes are something rejecting, but also more careful and sober models of consumption are not attractive.

A fundamental role in changing this pattern is given to schools, but there is the need of go further than the training approach about environmental problems, to take care of matters concerning behaviours, choices and marketing strategies. This challenge should privilege the laboratory approach, to make the students touch the questions in a concrete way.

The repulsion of wastes (that are old, dirty, not belonging to us) also regards the the job opportunities: the occupation on this sector is not trendy because in the collective imaginary it is still about professionals like the scavenger, actually outmoded, or because we just imagine an ordinary activity inside plants of disposal or incineration.

Indeed the evolution of the sector is living every day less relevance to the final phases of the cycle (disposal, incineration or plants for recovery), and more relevance to the most creative and innovative phases (reduction at source, reuse), with job opportunities connected to design and communication.

Waste production and management in Italy

The most recent data tell us that in Italy it has been produced about 136 millions of tonnes of special wastes (in 2015) and 30.1 millions of tonnes of urban solid wastes (in 2016).

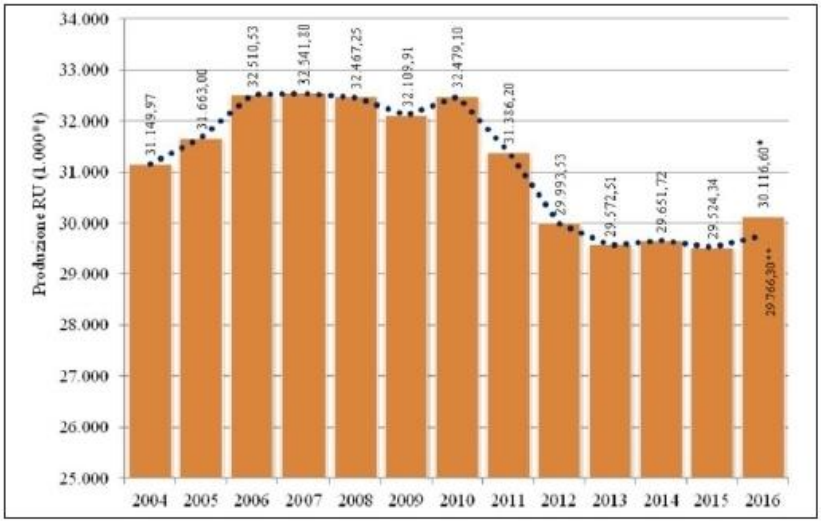

Image 1 – Trend of the production of urban solid wastes in Italy, years 2004 - 2016, Source: ISPRA, 2017

During the last 40 years the production of waste almost tripled. According to may experts, this is a consequence of two main processes: the strong increase of the packaging of goods and, in second instance,

the growth of the consumption of non-food products, especially electronics goods (cell phones, mp3 devices, game consoles, computers and tablets, mass storage disks…in fact the sort of machineries that should promote the dematerialization!). What happened is both a change in the habits of consumption of our society and a bunch of choices made by the producers of goods, that decide which materials have to be used and in what way to package the goods for increasing the consumption.

But, even if the long period dynamics is of clear growth, we need to underline that the trend of the very last years is of decrease: between 2011 and 2015 urban solid wastes are overall decreased of about 3 millions of tonnes, with a small recovery in 2016, when the average production of waste is 497 kg for each Italian citizen (in 2006 we had a peak of 552 kg per capita). Probably the factors having an impact on this decrease are numerous (major awareness of the citizens, education campaigns in the schools…), but the main one is surely the long economic crisis we are facing, that brought with itself a general decrease of consumptions (and, of course, of wastes). We can say that the dynamic is more bonded to the present situation then virtuous.

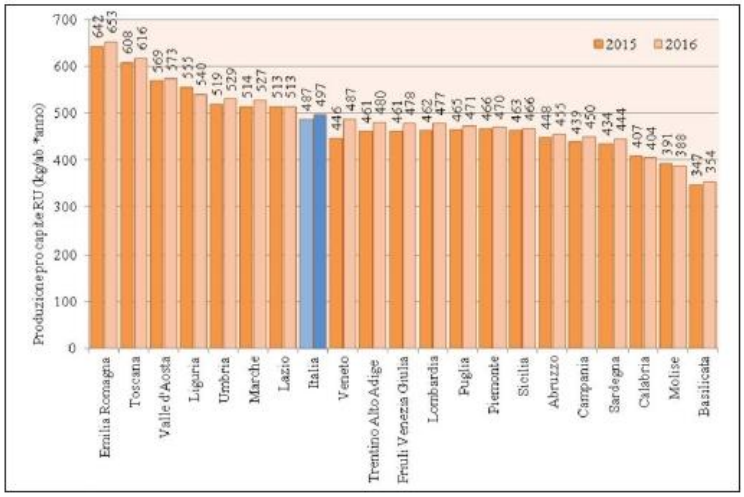

Image 2 – Production per capita of urban solid waste per region, years 2015-2016. Source: ISPRA, 2017.

Talking about the treatment of wastes, we are finally seeing the overtaking of recycle (in 2016 46% of wastes are recycled) despite the end-of-pipe modes, such as landfill (25%) and incineration (18%). These values are still under the European average and under the objectives gave by the European Union (50% of recycle by 2020), by at the same time they represent a big step forward, if we consider that in 1996 almost the 90% of urban solid waste ended its life in a landfill, and in 2001 that percentage was still 68%.

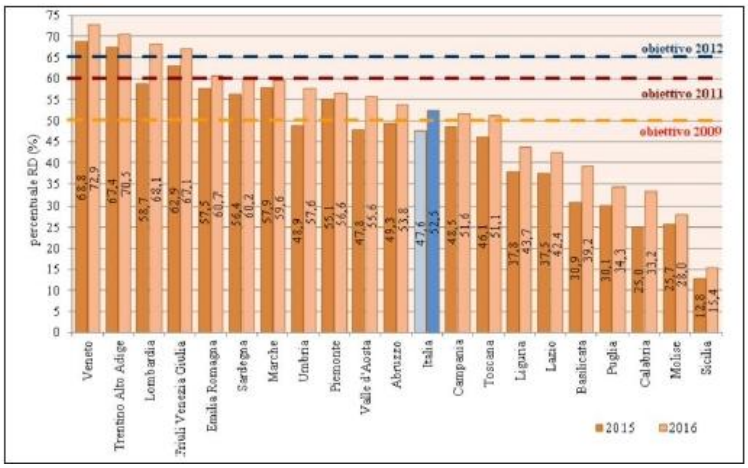

Image 3 – Percentage of separate waste collection of urban solid wastes per region, years 2015-2016. Source: ISPRA, 2017.

Even in this case, the National data hide very different situations by region: for example, if in Friuli Venezia Giulia and Lombardia the landfill is the arrival point of just the 4% of the total amount of urban solid waste (but with a huge part of wastes that go to incinerators and the consequent energy production), landfills collect 80% of urban wastes in Sicily, while only four of 20 Italian regions (Veneto, Trentino Alto Adige, Lombardia, Friuli Venezia Giulia) reach the objective of at least 65% of separate collection. In this case, the best region is Veneto (72,9%) and the worst is Sicily again (15,4%). The high regional differences are also connected to the presence of modern plants and the existence of a more or less modern system of integrated waste management.

The National production of special wastes is in 2015 about 132.4 millions of tonnes, 123.3 of which are not dangerous wastes, mostly composed (53 mln of t) by wastes of the construction sector.
The dangerous part in 2015 is almost 9.1 millions of tonnes, 13.6% of which are vehicles out of use. Other important sources of dangerous wastes are the metallurgical industry, the chemical industry, the pharmaceutical, the production of plastics and other products coming from oil refining.

The recycle percentages are much better for special wastes than for urban ones. Since the first industrialization, Italy – poor of raw materials – have always had a long industrial tradition and specific competences in recovery wastes and by-products from the production cycles, and today the 65% of special wastes is recycled.

Finally, a very important question is the contaminated sites one, such as abandoned industries or caves, former landfills, storage sites for dangerous materials. Between 1998 and 2007, in the whole Italian territory it has been identified by the State 57 particularly polluted areas, in relationship to the characteristics of the pollution and to the danger level, the extent and the impact on the surrenders in terms of health and ecological risk. These are the so called National Interest Contaminated Sites (SIN), mostly concerning industrial areas (abandoned or not), former mines and river pipes. 16 SIN over 57 concern landfills that need a reclamation, but those areas often have also other problems.

In 2012, 17 areas, that had actually a lower complexity, were assigned to the Regions for the reclamation, becoming Regional Interest Contaminated Sites (SIR).

Waste production and management in Europe

And what about the rest of Europe? How are wastes treated? Just checking inside European Union and the urban solid wastes disposal, things go often better than in Italy, even if there are big differences among countries, connected to the different levels of development.

According to the most recent data widespread by Eurostat, the statistical agency of EU, in 2016 each European citizen produced an average of 480 kg of waste (in Italy it was 497, 3.5% more). The worst countries were Denmark (777 kg per capita), Malta, Ciprus, Germany and Luxembourg (all between 600 and 650 kg per capita); these are followed by Ireland, Austria, Holland, France, Finland and Greece (500-600 kg per capita). In Italy, United Kingdom, Slovenia, Portugal, Lithuania, Spain, Sweden, Belgium, Latvia, Bulgaria and Croatia the amount of urban solid wastes is between 400 and 500 kg per capita, while in Hungary, Estonia, Slovak, Czech Republic, Poland and Romania citizens produce less than 400 kg of wastes.

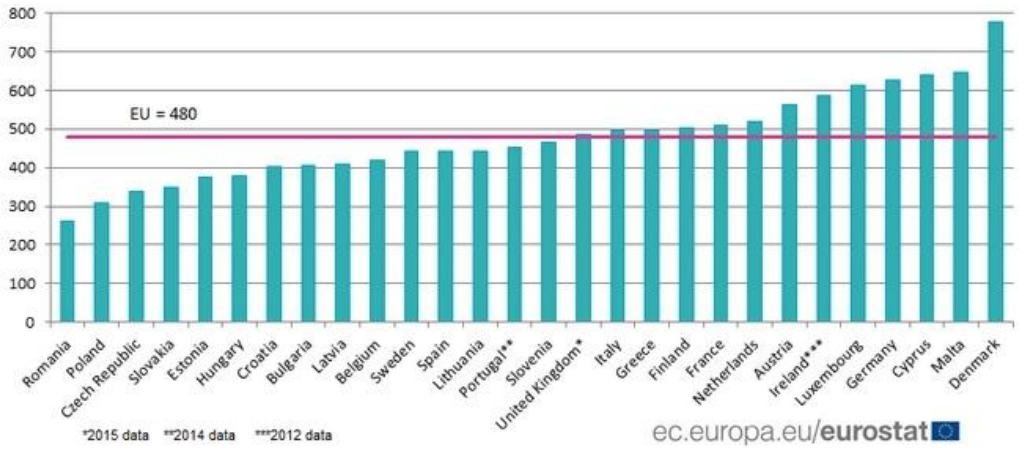

Image 4 – Production per capita of urban solid wastes in the European Union, year 2016, Source: Eurostat..

Inside EU only Romania produces less than 300 kg of wastes per capita (261 kg): that means that a Danish citizen, during 2016, produced on average an amount of urban wastes equal to three Romanian citizens.

Focusing on treatment, the main solutions remain the end-of-the-pipe ones (52%), even if they are strongly decreasing (in 2001 it concerned the 73% of wastes). Deepening, the part of urban solid waste sent to landfills in 2016 is 25% (it was 56% in 2001), the part that has been incinerated is 27% (17% in 2001), while the 46% is recovered through recycle or production of compost (it was 27% in 2001).

The treatment choices are very different among the European countries. If Holland, Denmark, Germany, Sweden, Belgium, Finland and Austria have quite eliminate landfills (Denmark actually choosing incineration instead), in Romania (80% of urban wastes), Cyprus (81%), Greece (82%) and Malta (92%) landfills are still the main option. Moreover Denmark (51%), the highest percentages of incinerated wastes concern Estonia (56%), Finland (55%), Sweden (50%), Holland (46%) and Belgium (45%). Germany shows the highest percentage of recycled wastes (66%), follow Austria (59%), Slovenia (58%) and Belgium (54%).

CHAPTER 2: REFERENCE LAW

Principles and European legislation

European Commission and European Parliament are the main source of laws on several issues, even the environmental ones.

Talking about wastes, the main reference law is Directive 98 of European Parliament and Board (2008/98/CE). This makes some basic statements about the definition of waste, recovery and disposal, reinforces the measures to be adopted for the prevention of waste, introduces an approach that considers the whole life cycle of products and materials and focuses on the reduction of environmental impacts connected to the production and management of wastes. It also establishes some essential obligations, such as the duty of authorization and registration for a company that handles wastes and the obligation for member States to draw plans and programmes for national waste management. The objective of this tool is to separate economic growth to the environmental impacts connected with the production of wastes inside the European Union.

The hearth of Directive 98 is represented by the fundamental principles, specifically:

1. the principle of minimization of negative impacts on environment and human health while treating wastes;

2. the “who pollutes pays” principle, or “extended responsibility of the producer”, that leads all the environmental policy of the European Union; applying it to the wastes means that the disposal costs have to be charged to the owner or the producer of the good;

3. the principle of hierarchy, according to which there is a precise order of priorities among the different options for waste management; this order states that the best solution is the prevention or reduction at source of wastes and the landfill disposal is the worse alternative, that have to be chosen only if there is no other options;

4. The principles of proximity and self-sufficiency, that mean each member State needs to have an integrated network of adequate plants in order to be able to take care of its own wastes.

With the first principle, the intent is to remark that a correct policy for the management of wastes is also a tool to protect and improve the efficacy in use of natural resources, because thanks to that the withdrawals of raw materials are reduced, as the use of natural heritage as a final collector of wastes.

Applying the principle of “who pollutes pays” to waste related issue is fundamental. Thanks to that, we introduce the idea of extended responsibility of the producers, that means to adopt measures obliging who produces, transforms, sells or import goods to take care of them long the whole life cycle, included the phase in which they turn into waste. This is a way to strengthen reuse, prevention and recycle of goods and materials. These measures can include the acceptance of returned products and of wastes made by their use, but also the management of wastes, the connected financial responsibility, the duty to inform customers about the future correct disposal. The supply chain consortia, that are present in every member State, were born under the impulse of this principle and are constituted by the producers of specific categories of goods (e.g. packaging, glass, oil, electronic wastes, batteries…), with the objective of taking care of the correct management and disposal of the products previously sold and now at the end of their lives.

The principle of hierarchy explains that a correct policy for wastes has a series of options, but there is a scale of priority for these options and, in the long term, we need to abandon the lower levels (landfill and incineration) to reach the highest (reduction at source and reuse). In this sense, every option is effective to treat wastes, but the higher ones in the scale have to be preferred and encouraged, because they guarantee a better environmental result.

The principles of self-sufficiency and proximity have been designed has a way to oblige each community to take care of its own waste, at least the urban ones, avoiding to move wastes around Europe (adding the environmental impact of transport and risking the involvement of organized crime) and to see some member States, maybe forced by difficult economic conditions, become the “dustbin” of all Europe. It is important to

remark that these principles are not rigid and don't oblige each local community (and not even each State) to own the whole range of plants, because it could cause in some specific realities continuous emergencies.

At present it is in its final phases of discussion at the European Parliament a series of directives known as "circular economy pack". They partially update the Directive 98 and, generally speaking, the European policy around wastes. The general intent is to promote a change of paradigm, moving from waste as a problem to waste as a resource, possible raw material for other productive processes.

Specifically, the pack gives new objectives for the reduction in the use of landfills, that shall not host more than 10% of produced wastes, and for the increase of recycle (55% at 2025, 60% at 2030, 65% at 2035). In order to reach these percentages it is made obligatory the activity of separate collection in every territory of the Union; also obligatory becomes the organic recycle and it is also introduced, first time at European level, the food waste issue. In the end, it is established a common methodology to calculate the quantities of separated wastes going to be recycled.

Italian legislation

The Italian legislation concerning waste is mostly contained by the Environmental Statute Book (D. Leg. 152/2006), that assimilated and updated the legislative decree 22/1997 (the so called Ronchi decree). In most recent years, the Italian legislation has been updated, adopting the European Directive 98 and also modifying some specific issue concerning the classification of wastes and the municipal waste tax.

Generally speaking, the National law classifies wastes according to their origin, distinguishing between urban wastes (that means the ones collected on public soil, that can be domestic or not domestic) and special wastes (produced by industries, shops and crafts companies), and according to their dangerousness, distinguishing between dangerous and not. For each kind of waste there are different ways of treatment and different criteria of collection.

Urban wastes are exclusive competence of the Municipality, so the wastes producer has to bestow them to the Municipality according with the rules established by it and has to pay a tax or a tribute for the collection service. The Municipality too has to cope with the regional prescriptions, such as minimum level of separate collection, established destination of the not recyclable waste, principles of self-sufficiency and proximity. Special wastes instead compete to the producer, that is obliged to confer them to specialized and authorized companies, that can proceed to the right treatment.

Spanish legislation

In Spain, waste management is regulated in the Spanish legal system through an extensive and varied conglomerate of norms that do not always coincide among the different Autonomous Communities (the 17 Autonomous Communities have a competence framework defined in their Statutes of Autonomy). This is due to the fact that the Autonomous Communities have the competence to issue additional protection standards that may be more demanding than those established by the State through basic legislation.

In the Spanish legal system, the transposition of European regulations has been carried out through Law 22/2011, of July 28, on waste and contaminated soils, that replace the Law 10/1998, of April 21, on Waste. This basic legislation is nevertheless completed with the specific regulation that certain types of waste have.

- RD 106/2008, of 1 February, on Batteries and Accumulators and the environmental management of their waste.
- RD 105/2008, of February 1, which regulates the production and management of construction and demolition waste
- Law 34/2007, of November 15, on air quality and protection of the atmosphere.
- RD 228/2006, of February 24, which modifies RD 1378/1999, of August 27, by which measures are established for the elimination and management of polychlorinated biphenyls, polychlorinated terphenyls and devices containing them.
- RD 679/2006, of June 2, by which the management of used industrial oils is regulated.

- RD 208/2005, of February 25, on Electrical and Electronic devices and the management of their waste.
- RD 1619/2005, of December 30, on the management of tires out of use.
- RD 653/2003, of May 30, on waste incineration
- RD 1383/2002, of December 20, on vehicle management at the end of its useful life.
- RD 1416/2001, of December 14, on phytosanitary product packaging
- Law 11/1997, of April 24, on Containers and Packaging Waste
- RD 1310/1990, of October 29, which regulates the use of sewage sludge in the agricultural sector

French legislation

France's policy on waste, like its environmental policy in general, is strongly influenced by Community policy. It has progressively diversified its objectives: public hygiene, security, reduction in the environmental impact of different treatments and, more recently, prevention and recycling. These main orientations are contained in the July 15th 1975 law amended by the July 13th 1992 law on elimination of waste and recovery of materials. Furthermore, waste treatment and elimination facilities are considered as classified installations in France, i.e. installations which may represent dangers or inconveniences for locals in terms of health, safety, public health, agriculture, protection of nature or the environment, and conservation of sites and monuments.

Regulations relating to Classified Installations oblige operators to assess their waste management and to implement reduction measures so as to minimise risks associated with their facilities. Substantial progress has been made in the quality of treatment and recycling facilities. Nevertheless, the use of landfill must be reduced still further and the production of waste has grown steadily until levelling off recently.

In autumn 2007, the Environment Grenelle was an opportunity to establish the main guidelines of a new national policy on waste management. By defining prevention and recycling objectives for waste for the period 2012-20151, this participative governance process has also defined 25 measures to reduce waste production, limit the quantities of waste sent to landfill and incinerated and to considerably develop recycling. These actions are perfectly in line with the priorities defined by the new waste framework directive (directive 2008/98/EC), which establishes a ranking between the different forms of waste treatment, with, by order of preference, prevention, preparation for re-use, recycling, other forms of recovery (in particular for energy), and elimination.

The Grenelle 1 Law uses this ranking specifying that the "waste reduction policy, which is a priority over all forms of treatment, will be bolstered by the eco-design of products in manufacturing, distribution and consumption until the end of its product lifecycle". The 2009-2012 waste plan announced in September 2009 summarises the Grenelle challenges and the framework Directive organising them into strategic themes.

Grenelle 1 Act had the following aims, among others :

- 7% reduction in the production of household waste by 2014
- Increase in material and organic recycling to achieve a recovery rate of 35% in 2012 (then 45% in 2015)
- 15% reduction in the quantity of waste sent to landfills or incinerated
- Planned rise of 75% in the recycling rate for household packaging waste in the space of 3 years.

Passed by parliament the following year, in July 2010, the Grenelle 2 law translated the programme set out by the first Grenelle Act into obligations, prohibitions and permissions. In practice, it entailed amending pre-existing codes (those pertaining to urban development, the environment, local authorities and sea ports) and devising the operational implementation of the 2009 proposals for action at the right regional levels, using the appropriate financial tools and recycling solutions.

A crucial step in the history of recycling in France is the waste reduction and recovery plan 2014-2020: this plan is an extension of the "circular economy" strand of the "energy transition for green growth bill. Its main goal is to halve the quantity of waste sent to landfills by 2025, reducing it by at least 30% between 2014 and 2020. It has the guiding principle of sending less to landfills and recycling more to reduce the environmental impact of waste, but also kick-starting various recycling sectors, which are big job creators.

In February 2016, France became the first country in the world to prohibit supermarkets from throwing away unused food through unanimously passed legislation. Now, supermarkets of a certain size must donate unused food or face a fine. Other policies require schools to teach students about food sustainability, companies to report food waste statistics in environmental reports, and restaurants to make take-out bags available.

Municipal Solid Waste (MSW) Indicators in France, MSW is defined by the following waste types: street sweeping, sewage sludge and garden and park waste (from municipal sources), household waste (recycling centre and bulky items, household hazardous waste and mixed & separately collected household waste). Finally, MSW includes trade waste similar in nature to household waste. Between 2001 and 2007, MSW management in France has essentially been driven by the Law of 13 July 1992, requesting municipal waste management plans to be submitted to the national authorities. These plans generally followed the principle of the waste hierarchy (reduction of landfilling, stabilisation of incineration with energy recovery, increase of material recovery and waste prevention goals) albeit with large differences among the different departments. From 2007, a change of direction in French waste management policy was initiated (Grenelle Environment process) with the overall objective to harmonise waste management targets at the national level.

Croatian legislation

Current waste management in Croatia is characterized by the lack of accurate information about who produces what type of waste in what quantities, how it is further treated and disposed; then by inadequate treatment of waste, by the lack of adequate facilities within waste management system (treatment, disposal); by difficulties in finding appropriate location for disposal sites (difficulties in obtaining approvals by local communities and permits by relevant authorities). Only recently a database of dumps has been established. The regulatory framework is relatively good in Croatia, and in spite of problems, there is a growing activity and interest in waste management.

In the Treaty of Accession of the Republic of Croatia to the European Union it is defined that all existing municipal waste disposal in Croatia must comply with the requirements of the Directive; the Republic of Croatia has been obliged to build all waste management centers and to treat properly all landfills until 31st December, 2018.

CHAPTER 3: POLICY INSTRUMENTS

Another important aspect of Directive 98 is that every member state is obliged to realize national plans for the management of waste. These plans provide an analysis of waste production and management, indicate measures and targets for reuse, recycle, recovery and disposal of wastes, evaluate how they can contribute to European objectives.

Each national plan is integrated by a programme of prevention of wastes, that indicates the objectives and modalities for the reduction at source of wastes. Plans and programmes are fundamental regulation actions that define the area in which the economic operators make their business and how they do it. The advantage over other policy instruments is their possibility to reach immediately the result, if matched with monitoring interventions and sanctions for the trespassers.

The prohibition in the use of single-use plastic bags is immediately effective since the day it is official. But the lack of controls made that in Italy, where the prohibition exists since 2011, still today quite 50% of bags are not biodegradable. Besides that, an imposition doesn't modify a not sustainable consumption style, the single-use one, that just turned, in the best cases, on biodegradable materials.

More effective in educational terms are the policy instruments that have an impact on our expenses, like taxes, that are a very flexible instrument: a light tax will determinate a modification of behaviours in long terms, while an important taxation reaches results very similar to prohibitions. So, maybe the best combination about shoppers is the prohibition of single-use plastics one and light taxation of biodegradable ones, in order to boost the reusable shoppers.

A fiscal policy instrument is more effective as its impact is stronger on the polluter. In many cases, the eco-tax on landfills did not determine an increase in separate collection, because the augmented cost was simply added to the balance with no explicit information to the citizens. The Payt (pay as you throw) system is much more effective because explicit the relationship between the amount of tax paid and the waste produced.

The opposite policy instrument of taxation is the use of subsidies, that practically means to pay the polluter to stop polluting. This tool can be desirable in all those cases where the pollution generated is very dangerous for health and environment and controls are difficult and expensive. An example is the discount obtained while buying a new car battery if the consumer returns the exhausted one. With this policy instrument the county of Parma reduced to zero the abandon of exhausted batteries, very toxic wastes.

CHAPTER 4: THE JOB MARKET

All around Europe, for a very long period, wastes have been considered a sanitary problem, so the person in charge to take care of it was the mayor. The municipalities managed the collection and disposal of urban wastes directly or through a public company.

The change of perspective brought by the integrated management also made some changes in the market: the principle of extended responsibility of the producer began to be applied to the packaging (and then to electric and electronic wastes) and it is the end of the idea that wastes are an exclusive issue of the municipality. In Germany for the first time, then in the rest of Europe, the management of wastes starts to involve new actors, such as the supply chain consortia, creating an economic market. The supply chain consortia involve all the producers and importers of different type of packaging, separated for material. In Italy there is also a big consortium that gather all the packaging consortia, CONAI (Packaging National Consortium).

In recent years we have seen a growth in the complexity of the market and different solutions applied in different territories: for example, in Northern Italy there has been an evolution in the public companies that are now bigger, not completely owned by public bodies and they manage not only waste but many others public services (gas, water, electricity…). These operators, so called multiutilities, can manage the whole chain (from collection to treatment), often are owners of the treatment plants and sometimes entrust smaller companies for the management of the most specific (or the less profitable) phases. This creates a jagged market, with opportunities for very different kind of companies: big, small, very specialized, innovative, profit and non-profit…

This kind of market is a direct consequence of the bunch of options available for each phase of the integrated management of wastes. The collection can be managed in several ways: house to house, light materials collection, heavy material collection, mixed ways involving both the street bins and the house to house system… Also the destination of the collected wastes can make some relevant differences in the market: where the territory invested in plants for the energy recovery from wastes we will not see big efforts in terms of recycling and so there will not be a big market for very specialized companies. Otherwise, where municipalities pursue a zero waste objective, companies specialized in management and recycling of very specific materials can have more luck.

Summarizing, if earlier the main professionals connected to wastes sector were the dustman and some technical of compactor machineries, now the integrated management opened a variety of new and sophisticated professionals, that need skills both technical and creative: the knowledge on how the treatment plants work, the skills to create and handle a communication campaign or to promote refitting and reuse, the eco-design issues, some knowledge on computer science… the waste sector definitely became a very complex world, in continuous change, that requires brand new competences and every day higher professionals.

CHAPTER 5: PROFESSIONALS

Eco-designer

Activity description

Over the 80% of the environmental impact of a product is pre-determined during its project phase. From here the relevance of the eco-design, or the capability to design a project constantly taking into consideration its whole impact, starting from raw materials, to the technologies used for the production, from packaging to the real opportunities of recycle. To do that it is necessary to use the Life Cycle Assessment methodology, that evaluates direct and indirect consequences of the entire life of a good.

Eco-design has been developed starting from the ’70, while an environmental consciousness was growing all around the world, bringing with it also the diffusion of critical consumption. Thinking specifically to the waste reduction, one of the most interesting approaches is the design for disassembly: it proposes techniques that simplify the assemblage of a product, in order to make easier the maintenance and the final disassembly, for the recovery of materials.

Competences

The eco-designer has the capability to design low environmental impact products, with criteria of minimum use of row materials and energy for their production, of reduction of consumption and emissions during the use and of easy disposal once they won’t be used any more. This third criterium can be reached using natural materials and/or using materials that are easy to be separated and reused.

It is a fundamental role in the productive chain, that requires high level competences that can be reached through a very specialized diploma or, more frequently, through and university degree and also some post degree training. We are typically talking about a degree in architecture and then a master in eco-design.

Reference job market and economical treatment

The main job opportunities are offered by professional studies of architecture or engineering, often concentrated in the biggest cities, but sometimes also in big companies that have a design office inside.

The typical economic treatment starts from 1300 euro/month for the graduated new employees and can grow consistently, in connection with experience and talent.

Course of study

At present ecology and sustainability are issues considered in each architecture and design course of study, but in Italy the most specialized centres are the Politecnico of Turin, the University of Camerino, the European Institute of Design, located in Milan, Rome, Venice, Turin, Florence, Cagliari, Madrid and Barcelona.

Networks

The strongest networks for eco-designers are represented by design schools, specialized blogs and web communities, that share news and feed the discussion among eco-designers.

Among all, in Italy we can indicate the web site www.architetturaecosostenibile.it and in Europe the Ecodesign Centre of Cardiff (Wales, UK). Another important subject is the European Network of Ecodesign Centres (ENEC).

Summary

The eco-designer has the capability to design low environmental impact products, with criteria of minimum use of row materials and energy for their production, of reduction of consumption and emissions during the use and of easy disposal once they won't be used any more. This third criterium can be reached using natural materials and/or using materials that are easy to be separated and reused.

To know more

http://www.core77.com/posts/15799/afterlife-an-essential-guide-to-design-for-disassembly-by-alex-diener-15799

Yeang K., *Ecodesign : a manual for ecological design*, London : Wiley-Academy, 2006

Manager of reuse market

Activity description

The recovery and reuse of products going to be trashed is an activity with a long history (everyone during the childhood made small markets to sell old comics and toys), but that in recent years is having a new spring. We are not talking about products that become source of second row materials, but of products that repaired, adapted or refreshed can have a second life. This normally happens inside advanced vintage markets, where it is possible to collect, repair, store and sell goods such as furniture, clothes, accessories, books, small machineries…

Competences

The management of a vintage circuit requires specific skills of logistics, organization, intuition and resourcefulness, because the basis of the activity is the collection of dismissed products that have a real potential, their organization and (sometimes) refitting and good personal attitude to sell. Other fundamental skills concern passion and empathy, because human relationships are a big part of the job.

Talking about the evaluation of the products, it is necessary to be very informed around design trends, because it happens that customers can be more interested in specific objects independently from their quality. For example, there is a strong interest for posters and placards from '50 and '60 and other vintage objects than for antique trade.

Reference job market and economical treatment

Vintage markets and stores are having a big diffusion in the last years, also thanks to the franchising chains. The main reasons concern both the economical crisis and the consequent need to spare, and an upcoming cultural change: after decades of unrestrained consumerism, forms of critical consumption are growing, also in connection to the augmented attention to sustainable development.

The success of a vintage store depends on the talent of the entrepreneur and also on the dimensions of the store. The average revenue is from 60.000 to 300.000 euro a year, with a monthly profit for the manager from 1.500 to 5.500 euro.

Most of the stores, at least the big ones, work in account sales, that means the goods are not purchased by the store, the owner remains the original one, which accepts to sell its product through the store, giving the store manager from 35% to 50% of the price once sold.

But if you want to work in the reuse and vintage market, at present you cannot ignore the online market: once it was e-bay, the website that gave the opportunity to small retailers all around the world to sell on-line, now there are many apps and websites, some of which very specialized in second hand and vintage, particularly clothes. Here you can find both the passionate that buys and sells for hobby and the professional retailer that also has a real shop somewhere. For example, one of the most successful apps Depop, born in England in 2011. The app counts now 8 million users all around the world, offices in London, Milan, New York and Los Angeles with a total of 100 employees and a movement of money in 2017 of 230 million dollars.

Course of study

This kind of job needs business competences, so the education can be obtained frequenting a technical and commercial school and then the faculty of economy or law at the university. Anyway, the degree is not obligatory.

Networks

The main networks are the franchising chains (e.g. in Italy Mercatopoli), that make available to the store managers trainings, technical assistance and a management software, but also some apps and web sites are not only e-commerce but also social media that create passionate virtual communities.

Summary

The manager of reuse market handles products that repaired, adapted or refreshed can have a second life. This normally happens inside advanced vintage markets, where it is possible to collect, repair, store and sell goods such as furniture, clothes, accessories, books, small machineries… This professional requires specific skills of logistics, organization, intuition and resourcefulness, because the basis of the activity is the collection of dismissed products that have a real potential, their organization and (sometimes) refitting and good personal attitude to sell. Other fundamental skills concern passion and empathy, because human relationships are a big part of the job.

To know more

Giuliani A., *Aprire un mercatino dell'usato*, (www.alessandrogiuliani.it), 2012

www.mercatopoli.it

www.depop.com

Technician of plants for conferment, treatment and recovery

Activity description

A plant for conferment, treatment and recovery of materials is a site where wastes are stocked, selected with the help of specific machineries, separated for categories, pressed and sent for re cycling as second row materials for industries. In the most advanced plants, the activities of separation are precise and customized to the needs of the client, for example it is possible to separate plastics for different polymers and glass for colours.

In most of the cases, these plants have an agreement with the packaging supply chain national consortia, that have the job to found the separate collection of packaging and find the most fitting destinations for the recycle of the recovered materials.

Competences

The skills needed by a technician who works in a conferment plant are the knowledge of the different operations of selection and the use of the machineries. More specific competences of management are required by the plant manager, that has to organize the job for all the employees involved and also has to deal with the packaging supply chain consortia and with the companies that can buy and use the recovered materials.

Reference job market and economical treatment

The second raw materials market is growing, connected to the increase of separate collection, thanks to a strong push from the European Union that promotes circular economy and, mostly, thanks to the continuous growth of the raw material's prices. A plant for conferment, treatment and recovery of materials represents an important actor in this market, a real knot in the network, the connection between waste collection and supply for the companies that use the recovered material. The plant also become a platform for the supply chain consortia, consenting them to organize the withdrawal for its associated companies.

A medium sized plant can occupy up to 70 persons and produce a revenue of about 7 million euro; the costs for building a plant vary between 10 to 20 million, depending on the dimensions and the machineries. Often the plants are property of multiutility companies.

The economical treatment can be of 1.000 euro a month for the easiest tasks (typically the pre selection of the materials), up to 5.000 for the management ones.

Course of study

Technical tasks require a technical high school diploma, or a middle school diploma followed by a professional training. Some of these trainings are very specific on this kind of professional for waste plants.

Management tasks frequently require a university degree, in engineering, science or economy.

Networks

Main networks for this kind of activity are the national supply chain consortia: in Italy there is one for plastics, one for steel and iron, one for aluminium, one for glass, one for paper and carton and one for wood.

Summary

A plant for conferment, treatment and recovery of materials is a site where wastes are stocked, selected with the help of specific machineries, separated for categories, pressed and sent for re cycling as second row materials for industries. In the most advanced plants, the activities of separation are precise and customized to the needs of the client, for example it is possible to separate plastics for different polymers and glass for colours. The skills needed by a technician who works in a conferment plant are the knowledge of the different operations of selection and the use of the machineries.

Technician of incinerator

Activity description

The incinerator can be considered a very big oven that burns wastes or a central for the production of energy, that uses wastes to do that. In this second case it is called waste-to-energy plant, because wastes are fuel that generates vapour, directed to produce thermal energy for industries or houses, or electrical energy. The effectiveness of wastes as fuel depends on how good they have been selected, removing the parts that have a low thermal power (organic wastes, metals, glass and inert).

The plant is capital high intensity, that means sophisticated technology, automated internal processes and few human resources to work. It is a very expensive industrial plant, involved in very big economic interests. To be convenient, the plant needs to burn big quantities of waste, more or less 2.000 – 2.500 tonnes every day, that correspond to some millions of citizens served.

Competences

A waste-to-energy plant is an industrial plant that works in loop for the production of energy.

The required skills are strictly technical, very similar to the ones of a professional that works in a oil refinery or in an energy production plant: management of combustion processes, production of vapour and energy, capability to take care or coordinate the operations of ordinary and extraordinary maintenance of mechanical, electric and electronic components, knowledge of pneumatic, hydraulic and electro technical processes.

To these skills, if you look at a management position, you need to add the capability to plan the stock of materials and the maintenance operations, the knowledge of the authorization requirements, of the monitoring plan and of the environmental control system and, generally, problem solving attitude.

Reference job market and economical treatment

At present in Italy are working 41 incinerators, 26 of which in the North, 8 in the central regions and 7 in Southern Italy. All the plants produce energy In most of the cases the plants are managed by multiutilities and in a few cases are managed by the same big companies that built them.

Work in plants like these means to be employed by big companies, where the economic treatment goes from 1.400 to 5.000 euro a month, depending on the tasks.

Course of study

The training is the typically technical one, from technical high schools diploma to engineering degrees. For the management positions it is often important to have previous experience in similar jobs in plants that work in loop.

Networks

Main networks are the one involving multi utilities, such as (in Italy) Federambiente and Federgasacqua.

Summary

A waste-to-energy plant is an industrial plant that works in loop for the production of energy. The required skills are strictly technical: management of combustion processes, production of vapour and energy, capability to take care or coordinate the operations of ordinary and extraordinary maintenance of mechanical, electric and electronic components, knowledge of pneumatic, hydraulic and electro technical processes.

To know more

http://www.dsa.unipr.it/trezzo/uni_parma/capitoli/tecnologie/recupero_di_energia_dalla_combustione_di_rsu.htm

Reclamation expert of landfills and contaminated sites

Activity description

A contaminated site is an area where human activities polluted soils, air, superficial and deepen water, with polluting concentrations higher than law limits.

The reclamation expert job consists in designing, coordinating and executing all the investigations to find the source of pollution and the polluting agents. Then it is necessary to evaluate separately the different sources/agents and estimate the threat for environment, also in connection with the importance of the elements to protect. The following phase is to define to future use of the site, after the restoration of an healthy condition. In the end the reclamation expert verifies and evaluates the efficacy of the proposed technical solutions and chooses the most sustainable.

Particularly interesting is the landfill mining, that is the mechanical excavation of landfills for the recovery of materials, the reclamation of soil and the creation of new volumes that prevents new landfills.

Competences

The reclamation expert job requires high level technical competences, about engineering, chemical, industrial processes and environment.

The new trend is the authorization of disposal sites that forecast, since their individuation, a plan for the environmental restoration. This requires design competences for the site, in order to reduce the future costs of reclaim.

Reference job market and economical treatment

The reclamation activity is constantly increasing, because of the environmental laws becoming more strict and contemporarily the progressive abandon of landfills for reuse and recycle. The reference market is both national and international and the reclamation services are required both by public bodies and private owners of contaminated sites. The companies that offer these services are engineering consulting societies or companies of environmental services, with good technical capabilities and ownership of the big machineries needed.

The economical treatment goes to 1.300 to 4.000 euro a month, depending on tasks, training and experience.

Course of study

The professionals goes from the yard technical (that can have a techincal high school diploma) to the ones that have higher competences and tasks, that need a university degree (engineering, environmental science or chemistry). Higher specialization can be reached through a master.

Networks

In Italy the companies working in this sector have to be signed in a National register. There is also a network called Reconnet, that involves companies, universities, research institutes and environmental agencies. For single professionals the main network is the association of environmental engineers. A good place for networking is the annual fair RemTech Expo, that takes place in Ferrara in autumn.

At European level, there is a Platform for environmental professionals called Enep.

Summary

The reclamation expert job consists in designing, coordinating and executing all the investigations to find the source of pollution and the polluting agents. Then it is necessary to evaluate separately the different sources/agents and estimate the threat for environment, also in connection with the importance of the elements to protect. The following phase is to define to future use of the site, after the restoration of an healthy condition. In the end the reclamation expert verifies and evaluates the efficacy of the proposed technical solutions and chooses the most sustainables.

To know more

www.reconnet.net

http://www.efaep.org/enep

http://www.efaep.org/enep

CHAPTER 6: CASE STUDIES

Bottled courage campaign

In South Africa in 2010, when Wesley Snejider jumped higher than the Brazilian defence, scoring the second goal of the match, when Giovanni Van Brockhorst opened to Holland the road to the final signing against Uruguay one of the most beautiful goals of the World Cup, when Arjien Robben went straight to the net missing the goal that could have changed the history of the trophy, each of them wore…8 bottles of plastics!

Yes, because Nike, one of the most famous sports brands in the world, in occasion of the Football World Cup 2010 in South Africa launched its brand *Considered Design*™: soccer t-shirts with high performances of resistance, elasticity and thermal insulation, but completely realized with recycled polyester, each one made by recycling 8 bottles of water. This aspect has been stressed by the company advertisers, that invented a very effective claim for these technical clothes, “Bottled courage”.

Using this material, Nike sent to recycling almost 13 millions of plastics bottles, equal to 254 tonnes of wastes, recovered in collection centres in Japan and Taiwan. This process has a series of steps: first the bottles are cleaned, then there is the removal of the labels, the grinding and the fusion in a material that will be spun to become the basis for the fabric of the t-shirts. This process prevents the use of raw materials and also allows a 30% energy saving.

Besides Holland team, the Nike’s *Considered Design*™ had been wore during South Africa 2010 by Brazil, Portugal, South Korea, Serbia and Usa. After the World Cup they have been chosen by several private teams, such as Juventus, Inter, Bareclona, Paris Saint Germaine and so on…

The project’s objective is to reduce and progressively eliminate the toxic substances and wastes, increase the use of recycled materials, empower the environmental impact of the products.

At this same logic answer other products of Nike, such as the soccer shoes *Green Speed*, produced with recycled materials for at least 70% of the shoelaces, 15% of the fabric and 50% of the sole. They are also designed to reduce the use of material and scraps and to make easier the separation between recyclable and not recyclable materials at the end of shoes life. Nike *Green Speed* has been designed and produced in Italy.

What is very significant of this case study is that even a big multinational like Nike, that has been frequently accused of green washing and unfair behaviour towards its employees, is interested in promoting ecodesign and recycled products, showing the economic relevance of sustainability.

Zero waste: from utopia to practice

When some years ago people started talking about “zero waste”, it seemed to be just a slogan or an irrational dream: a future without wastes, such as the Mars colonization or the end of oil era. Indeed, what seemed utopia, today appears a possible achievement, a well defined road in many countries: from Australia to Canada, from Usa to Italy, from Philippines to Uk.

First of all, what does zero waste means? According to the definition proposed by the Zero Waste International Alliance, it means products thought, designed and realized to reduce their volume (and the amount of waste!) and to preserve and recovery the materials, progressively bringing to zero incineration and landfill disposal. Zero waste strategy tries to emulate the sustainability of natural cycles, where each waste become resource for someone else. So the basis is the same logics of the hierarchy principle promoted by European Union, the one that states highest priority in waste management to the reduction to source and to the reuse, and lowest to incineration and landfill.

How can cities achieve this objective? The International Paper of Naples, wrote and signed in 2009 by the participants to the 5th convention on zero waste strategy, indicates to politicians and public administrators 10 fundamental actions to embrace zero waste philosophy:

1. **separation at source;** the problem of waste management is not technological but organizational ad needs the involvement of citizens with a good separate collection;

2. **door to door collection,** that is the best way to obtain high percentage of recovered materials;

3. **composting,** through a dedicated plant that can collect both urban organic wastes and agricultural ones;

4. **recycle**; the city should have platforms and plants for the selection of the materials and their re-integration in the productive chain as second raw materials;

5. **reduction of wastes,** by changing behaviours and life styles, also educating citizens to avoid packaging as more as possible;

6. reuse and reparation, also trough education and promotion of second hand and reparation stores;

7. **P.A.Y.T. (pay as you throw)**, that makes people pay for the produced and not recyclable wastes and encourages them to conscious consumption;

8. **recovery;** realization of a plant for the selection of wastes, in order to recover any recyclable material and prevent that toxic wastes go to landfill;

9. **research and design centre;** creations of centres for research and industrial eco design;

10. **zero waste;** the final objective is until an end date to redirect from end of cycle plants (landfills and incinerators) at least 90% of wastes that at present have this final destination.

Practically, Zero waste strategy needs several skills and competences, with a role for each actor: citizens and local communities, that have to change their consumption behaviours; entrepreneurs and designers, that need to change their production way; institutions, that have to use every policy instrument they have (politics, economic incentives, sensitization campaigns, investments) to make revolutionary changes in the system of waste management.

In Italy the Strategy Zero Waste has been adopted at present by 271 municipalities, constantly and quickly growing, with a big concentration in Central and Southern Italy, for a total involvement of about 6 millions inhabitants. Looking abroad, the real leader of Zero Waste movement is San Francisco, that diverted nearly 80% diversion in 2012 (the highest rate of any major U.S. city) and continues to implement innovative initiatives: for example the city collects every day 650 tonnes of organic waste, treat them to produce compost and sells that compost to local farmers and vineyards. The city also banned by ordinance polystyrene and other non-recyclable, non-compostable food service items and introduced clear rules for many kind of goods, in order to promote their reuse or to treat them properly.

Ecomafia and wastes

Ecomafia is a word invented in recent years by Legambiente, the biggest environmental association of Italy. This happened in 1997, when the association published its first report about business concerning environment that are managed by organized crime associations. The report was realized with the help of the Italian police. The report is now published every year and it is a good picture on illicit business around environment.

Main ecomafia activities are building abuse, exotic animals commerce (forbidden by the International agreement CITIES), theft of archaeological objects and, most of all, illegal management of wastes. This last

activity is so profitable that a boss declared to a journalist that “wastes is a more convenient traffic than drugs”.

We talk about different practices, such as:

- abusive landfills;
- disappearance of wastes that should be treated and instead, once taken in charge by the authorized brokers, are burnt or buried in abandoned fields;
- forgery of the documents that travel with wastes, in order to classify and treat them as simpler and less polluting materials;
- mix toxic and non toxic wastes, in order to hide the toxic ones.

All these expedients are possible because the waste chain, from their production to their final destination is very long, even geographically. And longer is the chain, higher is the presence of brokers on it.

It is wrong imagining ecomafia as a close and impenetrable world, made of gangsters with dirty faces, it is indeed a wide grey zone, populated by many subjects, often with clean and respectable faces: the company that contracts the disposal of its waste to the best offer, pretending to not know that such a low price can be reached only with illegal activities; the local administrator, that accepts bribes for closing an eye on some situations; the technician consciously distracted during the chemical analysis of the materials… The gangster that we recognize in our cliché is just the one that handles the final phase, from burning to stocking in abusive landfills (often former pits or former repositories for fuels) even to sinking ships full of toxic wastes.

The veil that covered ecomafias had been raised in 1992, when Nunzio Perrella, former boss of Traiano (a barrio of Naples), confessed to the judge Franco Roberti, that was investigating about drug traffics: “Doctor, for us trash is gold”. Italy discovered with stupefaction the existence of an illegal traffic of wastes. To contrast that, some fundamental and innovative actions have been settled in these years: the most important is the introduction of article 260 of Environmental Code (2002), that established the crime of “Organized activity for illegal traffic of wastes”, recognizing that behind these criminal offences there are not single persons but organizations. Another fundamental step happened in 2010, when the competence to investigate on waste traffic was assigned to specific offices of justice, the Antimafia Districts. This gave to the investigators more power and specific skills and also made clear that this kind of crimes concern mafias.

To have an idea of the dimensions of the phenomenon, during the decade 2002-2012 there have been 191 judicial inquiries, with 85 attorneys involved all around Italy. The investigations brought to 1.199 arrests and 3.348 persons denounced. The companies involved were 666 and the mafia clans 39. In 89 inquiries it was confiscated a total amount of 13,1 millions of tonnes of wastes. Finally, the total estimated business volume is 43 billions.

Talking about the route of these wastes, we do not only see industrial waste produced in Northern Italy going South to be (mis)treated, but mostly an intricate network of travels, sometimes South-North, or even an international one. In fact during the 191 inquiries, the investigations often involved other national states (22 in total): from Greece to Bulgaria, from England to Norway, from China to Congo.

If we still think that ecomafias doesn’t concern our lives, we need to remember some stories. The first is the one of the ‘land of fires’. It is not a region of Patagonia, that is Land of Fire, but it’s a wide part of the county of Naples, inside the municipal territories of Quagliano, Villaricca and Giugliano, so called because there the camorra (the Campania’s mafia) normally burns dumps in the fields or near the streets. The fires spread around in the air and in the soil very toxic substances, especially dioxin. All these poisons enter in the food chain and cause severe consequences to human health.

Another emergency created by ecomafias is the story of the so called poison ships. Starting from 2005 the repented Francesco Fonti told the police about the organized sinking of several ships containing toxic wastes in the Mediterranean sea, handled by ‘ndrangheta (Calabrian mafia).

In the end we need to remember the Italian journalist Ilaria Alpi, killed in 1994 in Somalia, together with her camera operator Milan Hrovatin. At that time she was following a story about traffics of radioactive wastes from Italy to Somalia.

Very important for the discovery of these crimes is the role of journalism: this year, 2018, an important traffic with bribes and many persons involved was discovered in Campania region tank to the work undercover of a repented together with a group of brave journalists of Fanpage.it. From that inquiry (that you can see online on their website), started a police investigation that led to important accusations and arrests.

CHAPTER 7: LABORATORIES

Laboratory: an action of research in the local contest

The idea

The territorial research is composed by a bibliographic part and a field research part, that is meant to deepen one or more aspects of integrated waste management. This work allows to insert in the local contest what learnt in theory.

A research action implies a continuous update of the hypothesis, because it is frequent that new information oblige us to modify something already written or even the whole structure of the research. Research is a good metaphor for our way of live, that changes while we learn the environment that surrounds us and to which, by nature, we adapt.

As our topic is really wide, first we have to delimit or field of investigation. For instance, we can decide to "follow" one or more materials to see how they are treated or we can analyze the structure of the integrated waste management in our municipality or we can study a specific professional that deals with wastes.

Here we will specifically concentrate on separate collection of wastes in our municipality. To do that we also need to think about how many wastes are produced, who is the responsible for the collection, how are they treated, how the collection is arranged and how effective it is, what's the evolution and which are the benefits, which problems still remain and how they could be faced and solved.

The first discussion moment can be all together in class, with the teacher that moderates and facilitates the discussion. The debate shall turn into a minutes, in which all the different points of view are presented and all the most interesting information are listed.

Learning objectives

To learn a method for territorial research, to deepen the topic of integrated waste management.

Who is the target

Last three years of any kind of high schools.

Work tracks and realization

As always when starting writing, the first question is the recipient of the document. If we want to realize a research about the separate collection of waste in our municipality, our recipient can be the citizen that every day separates its waste and could be interested in knowing what's next and how to do it better.

The specification of the subject that we are addressing consents us to define the central point of the work and also the type of document and its style, thinking about how to communicate and spread the results of the research. In our specific case, the report could have two outputs: an article for the local newspaper and an information brochure that could be distributed to citizens by the Municipality. The research report has all the elements to produce both outputs.

After that, it is possible to define the structure of the report, that has to face at least these points:

1. **picture of the problem**: production of waste and necessity of reduction. Why separate collection is important;

2. **main actors and activities**: who are the local responsible and the subjects involved in the separate collection and integrated management of wastes; who tackles the problem and how (objectives, competences, activities)

3. **future projects and objectives of the actors**; how do they think to improve effectiveness and efficiency of their work;

4. **points of strength and weaknesses of the service**, in relationship of problems management and objective achievement;

5. **conclusions** of the group of work.

Talking about the research method, it is necessary to keep a written track of everything is done, especially because it's a team work; in this way all the collected information are available to everybody. Also important to keep in mind that the analysis of information needs time and concentration, so every document shared has to be simple and essential.

Starting point of the research is the complex of ideas and information emerged during the first two debates in class. We have some basic elements but also several open questions that can guide our investigation. We can design a first draft of the structure, the classic one is composed by introduction, object of the analysis and conclusion. We need to list the elements we will insert in our research and for each one we have to evaluate the information we already have. To do that we could help us with post-it, posters or boards… at this point we also have clear the information we don't have, for which we need to organize a timesheet and the way we will collect them, through bibliographic research or field research.

Bibliographic research consents to collect and organize the coded information we can find on books, web sites and other products of specific subjects like municipalities, environmental associations and so on. Normally at local level the most interesting information will be found on actors' websites: the Municipality web site can give information about waste tax; the web site of the company that manages the separate collection and treatment of waste can be useful to understand how the service is organized, the waste chain and the different phases of integrated waste management; the web site of environmental associations may give information about problems and impacts of waste management.

After this collection, every researcher details and corrects the already available information, then the group discuss the new version of the document and decide which information are going to be deepen through field research.

Field research is a very interesting and challenging part of work, that involves the selection of local experts who can give us the information needed to complete our analytic frame. It could be pleasant for the class to invite the experts in class for an interview.

The interview has to be prepared very carefully, with a series of open questions that go to the hearth of the problem and that give the interviewed the opportunity to tell the class also personal stories that make more interesting and understandable the topic. The track of the interview can also be modified by the local expert, that can suggest some other important issues, and generally the students need to be flexible and ready to change the established path, remembering the final goal. It is useful to ask the interviewed his contacts (cell phone and e-mail), in order to ask eventually other information and send the report once finished.

The whole activity can be done during half of the year, dedicating one hour in class and one hour at home each week.

Laboratory: separate collection at school

The idea

"The cup of coffee? Where do I through the cup? They are made of plastics, but they're not packaging and they're also dirty…mmm, I don't know…".

How many times, as citizens, we had to face the same doubts? How many times a change in the multiutility organization confused us completely? Separate collection asks us to turn into aware citizens, but awareness needs attention and competence. For this reason it can be learnt at school and transmitted by students to their families and the rest of citizens, with an articulated series of actions, both basic and creative ones.

The following work tracks can be strongly integrated and modified as parts of a multiannual project or as experience work packages.

Learning objectives

To know the modalities of separate collection, to focus the wastes question, to under stand the communication tools and to develop creativity.

Who is the target

Last three years of any kind of high schools.

Work tracks and realization

1. **the separate collection at school**

Teamwork version

A class (or a group composed by the students deputies of each class) meets the local multiutility to have a precise explanation of how to correctly separate different kind of wastes.

In a first phase it is chosen and arranged a common school area (for example near the cafeteria) where put the bins for separate collection; each bin will be garrisoned for a whole week during some specific moments (entry at school, school interval, lunch time) by an expert, that is a student involved in the project, who will train the other students and prevent mistakes of separation.

After this first week, it will take place a meeting for all the school community (students, teachers and employees), in order to tell the experience at the presence of some multiutility referents, highlighting the most common mistakes and doubts. From now on the separate collection can be extended also inside the classrooms.

Contest version

In this version small bins are situated in each classroom; at the end of every school interval the bins are checked by the referents of the project and, according to the mistakes made, each class obtains a score. At the end of the week the project group reveals the ranking and the best classes obtain a prize.

2. **permanent observatory on school waste**

After the work package n.1, this second work package aims at the organization of separate collection in each class and in the common spaces of the school building (also in the administrative offices), with the positioning of bins in the classrooms and the dressing of a sort of ecological station inside the school and for its exclusive use.

Thanks to a pilot agreement with the local multiutility, if the school reaches some established targets of separate collection the multiutility ensures a discount on the waste tax or a donation of school materials or useful services (for example programmes of environmental education).

Besides the growth of awareness of students about separate collection and waste issues, this kind of agreement gives the chance to verify directly that a correct waste management gives concrete advantages for the whole community.

3. **the collection guardians**

With the same logic of the work track n.1, students are “sent” in different places of the neighbourhood, where there are bins of the separate collection, in order to train citizens at a correct disposal, offering to verify together what’s inside their bags and reporting the mistakes. The students wear a t-shirt that immediately identifies them as “separate collection guardians”.

At the end of the experience, the students involved tell to the whole school how i sit gone.

4. **the multimedia lab: interviews, ads, guerrilla marketing**

This work track approaches the separate collection as a topic for a multimedia lab that involves a whole class with several options: the realization of a social advertising; a journalist inquiry; a guerrilla marketing campaign.

All these activities can also be useful tools for the previous work tracks.

CHAPTER 8. BIBLIOGRAPHY AND SITOGRAPHY

Andretta A., Brogna G., Forni A., *Analisi di rischio di siti contaminati e discariche di rifiuti : concetti generali e casi applicativi*, Piacenza, Irnerio, 2009

Balzaretti E., Gargiulo B, *La comunicazione ambientale: sistemi, scenari e prospettive. Buone pratiche per una comunicazione efficace*, Milano, Franco Angeli, 2009

Barbero S., Cozzo B., *Ecodesign*, Milano, Gribaudo, 2009

Bianchi D. (a cura di), *Il riciclo ecoefficiente – L'industria italiana del riciclo tra globalizzazione e sfide della crisi*, Edizioni Ambiente, 2012

BiPRO, *Screening of waste management performance of EU Member States*, Report prepared for the European Commission, DG ENV, 7/2012

Bovino C., 2010*Tracciabilità dei rifiuti: il SISTRI e la fase transitoria. Guida pratica all'applicazione*, Ipsoa Indicitalia

Caiazzo M., Viselli R. (a cura di), *Rapporto Bonifiche 2010*, Ferderambiente, 2010

Carnevale E., Corti A., Lombardi L., *Stato dell'arte internazionale sulle tecnologie di mitigazione dell'impatto ambientale degli impianti di termovalorizzazione dei rifiuti urbani*, Firenze, 2005

Direttiva 2008/98/CE del Parlamento Europeo e del Consiglio del 19 novembre 2008 relativa ai rifiuti, Gazzetta ufficiale dell'Unione europea, 22.11.2008

Donzelli R., Munari B., Polato P., *Guida ai lavori in legno*, Milano, Mondadori, 1978 (ultima ediz. 1994)

European Environmental Agency (EEA), *Managing municipal solid waste — a review of achievements in 32 European countries*, 2/2013 (in inglese)

Eurostat, *Europe in Figures, Eurostat Yearbook 2012*, Luxembourg, 2012

Federambiente, Enea, *Rapporto sul recupero energetico da rifiuti urbani in Italia,* 3° Edizione, 2012.

Ferry D., *The Urban Quest for 'Zero' Waste*, Fortune, 12/09/2011

Gelisio T., Gisotti M., *Guida ai green jobs*, Milano, Edizioni Ambiente, 2009

Gilli G. A., *Come si fa ricerca*, Milano, Mondadori, 1971

Giuliani A., *Aprire un mercatino dell'usato*, (www.alessandrogiuliani.it), 2012

Greenpeace Italia, *Come funziona un inceneritore?*, 2005Cassinelli N., Del Duro R., *La raccolta differenziata e il riciclo delle materie seconde*, Milano, Franco Angeli, 2008

Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), *Rapporto rifiuti urbani 2012*, Roma, 6/2012

Kaulard A. Massarutto A., *La gestione integrata dei rifiuti urbani: un'analisi dei costi industriali*, Milano, Franco Angeli, 1997

Kraemer L., Onida M., *I rifiuti nel XXI secolo*, Milano, Edizioni Ambiente, 1999

Legambiente, *Speciale Comuni ricicloni 2012*, Rifiuti oggi, Anno 22, n. 1, 2013

Levinson C. J., Hanley P. R. J., *Guerrilla marketing. Mente, persuasione, mercato*, Castelvecchi, Firenze, 2007

Luppi P., *Tutto da rifare. Manuale pratico di riuso, riciclo, riparazione e baratto*, Milano, Terre di Mezzo, 2006

Massarutto A., *I rifiuti*, Bologna, Il Mulino (collana Farsi un'idea), 2010

Morisi M., Paci A., *Il bisogno di decidere. Termovalorizzatori dalla politica dei rifiuti al rifiuto della politica*, Bologna, Il Mulino, 2009

Nathanail C. P., Bardos R. P., *Reclamation of contaminated land*, Chichester, Wiley, 2004

Osservatorio Ambiente e Legalità di Legambiente, 2012, *Ecomafia 2012. Le storie e i numeri della criminalità ambientale*, Milano, Edizioni Ambiente

Osti G., *Il coinvolgimento dei cittadini nella gestione dei rifiuti*, Milano, Angeli, 2002

Osti G., *Nuovi asceti. Consumatori, imprese e istituzioni di fronte alla crisi ambientale*, Bologna, Il Mulino, 2006

Pario Perra D., *Low Cost Design*, Milano, Silvana Editoriale Arte, 2010

Pogutz S., Tencati A., *I mercati del recupero. un'analisi di sistema*, Rapporto di ricerca Università Bocconi-CONAI, 2003

Ragazzi M., Del Duro R., *Introduzione alla termovalorizzazione dei rifiuti*, Milano, F. Angeli, 2006

Simon H. A., *Le scienze dell'artificiale*, Bologna, Il Mulino, 1988

Sissa G., *Il computer sostenibile: riduzione dei rifiuti elettronici, riuso dei PC e open source*, Milano, F. Angeli, 2008

Sori E., *Il rovescio della produzione*, Bologna, Il Mulino, 1999

Strasser S., *Waste and want: a social history of trash*, New York, Metropolitan Books, 1999

Viale G., *Azzerare i rifiuti*, Torino, Bollati Boringhieri 2008

Viale G., *Governare i rifiuti: difesa dell'ambiente, creazione d'impresa, qualificazione del lavoro, sviluppo sostenibile, cultura materiale e identità sociale dal mondo dei rifiuti*, Torino, Bollati Boringhieri, 1999

Yeang K., *Ecodesign : a manual for ecological design*, London : Wiley-Academy, 2006

Web sites

http://it.scribd.com/doc/75996770/Dossier

http://leg16.camera.it/544?stenog=/_dati/leg16/lavori/documentiparlamentari/indiceetesti/023/021

http://logga.me/ndranghetanews/2013/01/24/relazione-sui-possibili-interessi-della-criminalita-organizzata-sul-traffico-marittimo-a-cura-del-comitato-ristretto-della-commissione-antimafia/

http://nikeinc.com/considered-design

http://speciali.espresso.repubblica.it/interattivi/dossier/index.html

http://zerowasteitaly.blogspot.it

www.avvocatisenzafrontiere.it

www.centroantartide.it/index.php/it/cosa-facciamo-ita/rifiuti

www.cial.it

www.comieco.org

www.conai.it

www.consorzioricrea.org

www.corepla.it

www.coreve.it

www.d4-videoshow.com/news.asp?lang=it&id=26

www.ecoblog.it/post/58907/navi-dei-veleni-la-relazione-della-commissione-parlamentare-dinchiesta

www.ecodallecitta.it/notizie.php?id=103242

www.ecosportello.org

www.greenbiz.com/blog/2009/10/19/considered-design-closing-loop

www.greenreport.it/_new/index.php?page=default&id=20949

www.infinitoedizioni.it/prodotto.php?tid=123

www.infondoalmar.info/

www.jaitalia.org

www.laboratoriocampano.org

www.laterradeifuochi.it/

www.legambiente.it/contenuti/articoli/i-numeri-dell%E2%80%99ecomafia

www.legambiente.it/contenuti/progetti-e-azioni/rifiuti-spa

www.legambiente.it/contenuti/sotto-tema/i-numeri-del-traffico-di-rifuti

www.legambiente.it/legambiente/osservatorio-nazionale-ambiente-e-legalit%C3%A0

www.legambiente.it/temi/ecomafia/traffico-di-rifiuti

www.liberainformazione.org/2013/02/28/toxic-somalia-sulla-pista-di-ilaria-alpi/

www.life-rels.org

www.raecycle.it

www.repubblica.it/2008/01/sezioni/cronaca/rifiuti-2/pm-boss/pm-boss.html

www.rifiutizerocapannori.it

www.rilegno.org

www.sistri.it

www.sufalnet4.eu

www.zonanucleare.com/dossier_italia/navi_affondate_rifiuti_radioattivi/E_espresso_formiciche_navi_veleni.htm

leg16.camera.it/544?stenog=/_dati/leg16/lavori/documentiparlamentari/indiceetesti/023/021&pagina=d020#04

Movies

Biutiful cauntri, di Esmeralda Calabria, Andrea D'Ambrosio, Peppe Ruggiero, Italia, 2007 (www.mymovies.it/dizionario/recensione.asp?id=55981)

Gomorra, di Matteo Garrone, Italia, 2008 (www.mymovies.it/film/2008/gomorra/)

The Millionaire, di Danny Boyd, Gran Bretagna-USA, 2008 (www.mymovies.it/film/2008/themillionaire/)

Trashed, di Candida Brady, Gran Bretagna, 2012 (www.mymovies.it/film/2012/trashed/)