

ARCHITECTURE HERITAGE and DESIGN

Carmine Gambardella

XXI INTERNATIONAL FORUM

Le Vie dei
Mercanti



World Heritage and Dwelling on Earth



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Carmine Gambardella
WORLD HERITAGE and DWELLING ON EARTH
Le Vie dei Mercanti
XXI International Forum

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Conference report

200 abstracts and 330 authors from 30 countries:

Albania, Australia, Belgium, Bosnia and Herzegovina, Brasil, Bulgaria, California, Chile, China, Cipro, Cuba, Egypt, France, Germany, Greece, India, Italy, Japan, Jordan, Malta, New Jersey, New York, Poland, Portugal, Russian Federation, Serbia, Spain, Texas, Tunisia, Turkey

XXI FORUM WORLD HERITAGE and DWELLING ON EARTH

Abitare la terra! Questo è l'obiettivo essenziale, sintetizzato dalla denominazione della conferenza, cui abbiamo continuamente teso con i Forum "Le Vie dei Mercanti" lungo gli ultimi ventuno anni. Ancora oggi, questa rimane per noi la stessa prospettiva di lavoro. Un intento da perseguire con ancor più forte convincimento e con persino maggiore efficacia, dal momento che tutti noi siamo coscienti di trovarci in uno stato di emergenza con lo scenario drammatico aperto dai cambiamenti climatici.

Quindi, come agire adesso rispetto a questo imperativo globale?

Per prima cosa, mi piacerebbe partire dal lavoro che abbiamo fatto in tutti i Forum annuali, dagli approfondimenti interconnessi sulla transizione ecologica, la contaminazione, il patrimonio culturale, i disastri ambientali, per ciò che concerne il loro impatto sul World Heritage. In tale modo, la preoccupazione per l'abitabilità della nostra terra ha non solo integrato capacità, esperienze, buone pratiche di ricercatori e accademici, ma ha anche creato una comunità scientifica con provenienze da ogni parte del mondo che fosse in grado di interagire in modo interdisciplinare. Ci siamo fondati sul convincimento che un'azione collaborativa richiedesse, oltre una prassi di controllo, una profonda fiducia nella capacità umana di riuscire a difendere il proprio patrimonio ereditario rigenerandolo con forte determinazione. Questa è la migliore strategia per trasmettere al futuro i beni che ci ha consegnato la storia e che noi dobbiamo difendere. Lo scopo perseguito è ovviamente non solo di quello potere agire in anticipo rispetto a un disastro ambientale, ma anche di promuovere nel nostro mondo un processo progettuale in grado di ridisegnare la relazione tra ciascun uomo e l'ambiente in cui vive.

Ribadendo in ciascun Forum che "il futuro è un eterno presente", abbiamo continuato a guardare a ciò che verrà con ottimismo, con la speranza che, cominciando sin d'ora con azioni effettive e coscienti, noi potessimo porre le basi per il mantenimento di un equilibrio globale. La recente pandemia ha mostrato come, al di là delle strategie resilienti per neutralizzare processi produttivi che si sono mostrati ostili al benessere ambientale, dovessimo ricercare una nuova omeostasi nel nostro ambiente abitabile. Solo lavorando insieme in questa direzione, potremmo efficientemente riadeguare via via le reazioni, in modo da neutralizzare persino gran parte degli impatti ambientali nella ricerca di un nuovo equilibrio.

L'argomento del Forum di quest'anno invita i ricercatori a riflettere sulle buone pratiche implementate con progetti operativi, strategie o proposte progettuali. Obiettivo principale è contrastare il processo che ha portato le persone e l'ambiente in cui vivono alle condizioni inaccettabili che riusciamo fisicamente a individuare con chiarezza nel degrado territoriale e paesaggistico. Inoltre, bisogna pensare a nuove strategie per un progetto difensivo che possa realmente dimostrarsi efficace. Ma ciò che è ancora più importante, una volta resosi conto dell'urgenza della situazione, è che l'enorme responsabilità ambientale ci impone di non fare affidamento su soluzioni semplicistiche. Non c'è alcuna semplice prestazione tecnologica che da sola possa essere assunta tout court come soluzione definitivamente ottimale, ma bisogna intervenire attraverso una dinamica osmotica di conoscenze e tecnologie. Solo attraverso un processo di conoscenze continuo le persone possono misurare lo stato del loro benessere e allo stesso tempo agire come garanti della qualità terrestre. Una nozione di "misura", fondata su una dinamica perpetua di conoscenza, può mostrarsi affidabile promuovendo nuovi modelli di sviluppo fondati su un rinnovato Umanesimo.

Prof. Carmine Gambardella
General Chair XXI Forum 'World Heritage and Dwelling on Earth'
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XXI FORUM WORLD HERITAGE and DWELLING ON EARTH

Abitare la terra! Dwelling on Earth! That is the essential goal, synthesized by the title of this conference, towards which we have been working with “Le vie dei Mercanti” forum over twenty-one years. It still remains today the same perspective for us. An intent to be pursued with greater commitment and providing even higher effectiveness, as we all are now aware of being in an emergency with the dramatic scenario opened by climate change.

Therefore, what are we to do now with respect to this global imperative?

First, I would like to start from the work we have done in every annual forum, the interconnected focus on Ecological Transition, Contamination, Legacy, Knowledge and Disaster, as regards their impact on World Heritage. In that way, the concern for the habitability of our Earth has not only integrated skills, experiences, good practices of Scholars and Academics, but has also created a scientific community from around the world for discussing such multidisciplinary topics. We had the conviction that collaborative action requires not only practices for control, but also a reliance on human ability to ever succeed in defending his patrimonial value with the strong determination to re-design our everyday places. This is the best way for transmitting to the future the values that heritage has passed on to us and we must protect. The pursued goal is obviously not only to act in advance with respect to an environmental disaster, but also to promote in our world a design process in order to re-design the relationship between each man and his living environment.

Emphasizing in each forum that for us the future is as an eternal present, we have continued to look at the future with optimism, with the trust that, beginning now with effective conscious actions, we can put the basis for maintaining a global equilibrium. Recent pandemic has shown that, apart from resilient strategies for neutralizing productive processes which showed to be hostile to the environment, we need to search for a new homeostasis into our habitable environment. Working towards this direction, we could effectively adjust responses to environmental changes, in order to neutralize even most of their consequences for reaching a new equilibrium.

So, the topic of this year’s forum invites researchers to reflect on good practices implemented with operative projects, design proposals or strategies. The main goal is reversing the trend which has led people and the environment in which they live to the unacceptable conditions we can physically recognize into territory and landscape decay. Then, we must think about new strategies for an adequate defensive design which can ultimately provide an efficient aid. But which is more important, once we have suddenly become aware of the urgency of the situation, the new enormous environmental responsibility requires us not to rely only on simple solutions. There is no easy technological performance to be assumed as a definitively optimal solution. Only the continuous practice of a “measure” that has been built upon continuous education process may give reliance; people, only with an adequate formation, can measure the state of their wellness and at the same time they can act as the guarantors of earth quality, for a new development model based on a renovated Humanism.

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AI and green transition: solutions for to nudge people towards correct waste management practices

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Abstract

Artificial Intelligence (AI) can play a significant role in accelerating the green transition by enabling more efficient use of resources, reducing emissions, and promoting sensibility in various analysing: it can optimise waste management by analysing data on waste production and identifying opportunities for recycling and reducing waste.

Here are some examples of nudging in waste management:

- Recycling reminders: AI-powered chatbots or mobile apps can send recycling reminders to users based on their location or the types of materials they have recently disposed of;
- Gamification: AI-powered games can be designed to encourage users to recycle and reduce waste;
- Personalized feedback: AI algorithms can analyse an individual's waste disposal patterns and provide personalised feedback on how they can improve their waste management practices;
- Social influence: AI algorithms can be used to analyse social media data and identify influencers who are promoting sustainable waste management practices;
- Behavioural intervention is used to identify behavioural barriers to correct waste management practices and develop targeted interventions to address these barriers.

This article aims to analyse the future of waste management, and AI-powered nudging looks promising, with many possibilities for improving efficiency, sustainability, and behaviour change.

In particular, we will analyse the possibility that these tools have to modify the perception of the problem of garbage in urban spaces with a specific interest in those transformations necessary to face the climate change underway.

Keywords: AI, Green Transition, Perception, Urban perception, Waste management

1. Introduction

Waste management is one of the three main contributors to climate change, one of the vital challenges for the future of human society and our planet. As a result, the European Parliament declared a state of climate emergency in Europe and urged all Member States to reduce greenhouse gas emissions by 2030 and to zero by 2050.

Proper waste management is a fundamental aspect of the ecological transition and the protection of the environment; the use of Artificial Intelligence can be an excellent solution to push people towards correct recycling practices and can revolutionise the contemporary research landscape by analysing large amounts of data more quickly and efficiently than was possible in the past. It means discoveries and trends that would otherwise have been difficult or impossible to spot can be made faster.

AI is changing how we work: many work processes, from routine tasks to complex decisions, can now be automated, freeing people from tedious and repetitive tasks and allowing them to focus on more value-added tasks.

However, AI has also raised concerns about excessive automation and the possible lack of work that results from it, thus generating a debate on the need for continuous training and reskilling to help people create new skills and adapt to market changes.

AI is transforming our work and research, offering new opportunities and challenges. Therefore, it is essential to understand and adapt to its impacts to maximise its potential and minimise its possible risks.

1. Nudging and visual representation

Nudging is a theory of behavioural economics that can be translated as a "gentle push", a positive reinforcement or an indirect suggestion that can influence people's behaviour in a predictable way but without prohibiting the individual's choice. Nudging is, in practice, a science that studies how we can positively influence people's behaviour without forcing or forbidding them to do something.

A nudge is "any aspect of choice architecture that alters people's behaviour in predictable ways without prohibiting the choice of other options and without significantly changing their economic incentives. To count as a mere prod, the intervention should be easy and inexpensive to avoid. Prods are not orders." (Thaler & Sunstein, 2009)

Nudging uses a combination of subtle stimuli, such as the arrangement of objects or the labelling of products, to guide people's behaviour; it is based on the theory of behavioural economics, according to which people do not always make rational decisions but are influenced by factors such as emotions, the surrounding environment and social influences.

A typical example of nudging is the "default option" or the default option. For example, when offering a donation option for a good cause, presetting the donation option is an essential nudging technique. In this case, the donation option preset implicitly suggests that donation is preferred and makes it more likely that people will opt for it.

Research published in PNAS (Garnett E., 2019) on methods to increase vegetable consumption in university cafeterias is one of several successful examples of nudging, gentle and non-explicit encouragement to make better choices for one's health or the environment.

Nudge, in general, can be defined as descriptive or injunctive, referring to the type of message: in particular, a descriptive nudge is a message that provides information about the behaviour of others. In contrast, an injunctive nudge is a message that indicates what people should do.

Descriptive nudge focuses on using social information to influence people's behaviour. In this type of message, a description of the behaviour of others is provided to encourage people to follow their behaviour. For example, a sign indicating the number of people who have already used the bicycle to work can be considered a descriptive nudge.

On the other hand, an injunctive nudge focuses on the use of directions or instructions to influence people's behaviour. In this type of message, an indication of what people should do to encourage them to take a specific action is given. For example, a sign stating, "Use your bicycle to get to work", can be considered an injunctive nudge.

However, research has shown that descriptive nudges may be more effective in promoting sustainable behaviour than injunctive nudges. This is because descriptive nudge uses social influence to motivate behaviour, while injunctive nudge can be perceived as a restriction or obligation, leading to resistance or adverse reactions from people.

The visual representation and communication tools through images are essential for communication and education in general: using pictures and pictograms can help provide recommendations on comparisons and guide choices.

Visual representation is one of the techniques used in nudging to influence people's behaviour sustainably, including in waste management. For example, visual cues or persuasive messages can encourage separate waste collection or reduce water waste. An example of the application of visual nudging with visual representation was an experiment that led to a significant increase in the separate collection of garbage by students of the Sant'Anna University of Pisa (Cosic C. & all 2018) through the use of posters that encouraged recycling by speaking the percentages of recovered material of the University with those of Harvard. In addition, visual representation can be an effective way to promote sustainable behaviour without imposing rules or sanctions.

To implement the nudge strategy, however, it is necessary to establish constant communication that contains information and feedback. In this way, it is possible to create a decision-making environment that pushes people to make good decisions for their interests.

For example, using colours to signal the degree of danger can effectively push people to make good decisions for their interests.

Environmental nudging techniques, in particular, offer several advantages: First, these techniques can help guide people's sustainable behaviours.

In addition, nudges can be used to promote collective action and environmental protection.

The green nudge policy focuses, in particular, on creating decision-making processes that push people to undertake valuable solutions for the well-being of the community, to contribute to the promotion of sustainable behaviour and to improve the quality of the environment.

Visual communication is used in many areas, including advertising, security and sustainability, and through images, colours, and layouts, it communicates a message.

Visual communication focuses on using visual elements to capture attention and convey a message effectively; for this reason, it is effective in environmental nudging projects.

An example of visual green nudging is the labels for communicating the ecological value already in use with different types of products: the representation methods take up those of the colour variants from red to green for the energy consumption certifications of appliances and homes.

The gentle push in this image exploits the association between red as a stop danger message and green with the meaning of natural green light, taking up the colours of the road regulations. This association makes the message clear and fast.



Fig. 1: Examples of Nutri-Score, Planet Score and Eco-Score labels for the classification of different types of products



Fig. 2: Examples of labels to highlight the impact of the product on CO2 production.

3. AI, Green Nudging and municipal waste management, practical examples

Proper waste management is a fundamental aspect of the ecological transition and the protection of the environment. Artificial Intelligence can be an excellent solution to push people towards correct waste management practices.

One possible application of AI is intelligent robots that can recognise and dispose of waste correctly. For example, these robots could be used in public areas such as parks or beaches, where people often abandon waste inappropriately.

Robotics and artificial intelligence can also be used to achieve recycling targets and increase the value of material flows; They can play a central role in automation and provide useful information to solve operational problems and improve the efficiency of recycling processes.

In addition, AI could be used to develop mobile applications that help people manage their waste correctly by providing information on how different types of waste are disposed of and the nearest collection points or by offering incentives such as discounts or rewards for those who dispose of their trash correctly.

AI could be used to analyse data on waste generation and management to identify areas where more action and improvements are needed by developing a more effective and targeted waste management strategy. The use of Artificial Intelligence can be an effective solution to push people towards

Good waste management practices and thus contribute to the ecological transition, the effectiveness of nudging in the environmental field is recognised at the European level.

Soluciones para una vida sin residuos

Go Zero Waste ofrece soluciones tecnológicas y educativas para avanzar hacia el residuo cero.

Descarga la app:



Educar



Facilitar



Innovar

Moving Towards Zero!

go zero waste

How does it work?

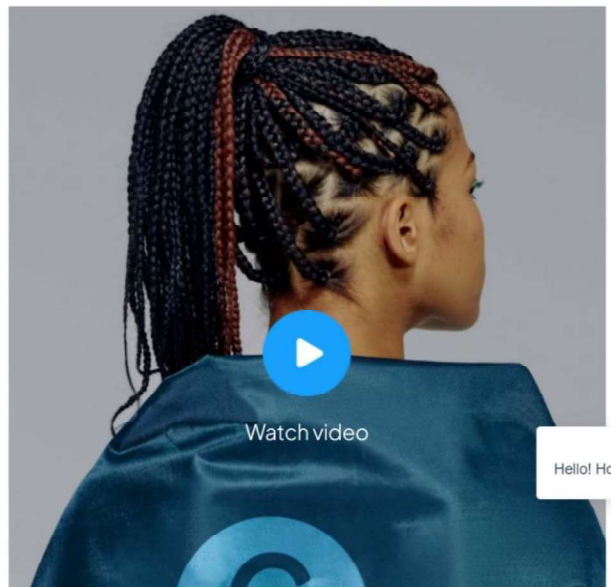
How to take part?

Objectives

Activate a campaign!

Start being sustainable with Moving Towards Zero!

A campaign to promote waste reduction, local commerce and climate education through new technologies and inclusive gamification.



Watch video

Hello! Hc

Recyclebank[®]
Powered by rts

Sign Up

Login →

Pick up points for recycling and learning online

Like a frequent flyer program, the more you do it, the more you'll earn.

Get Started →

Fig. 3: Examples of sites dedicated to recycling incentive projects that combine gamification and artificial intelligence.

Recycle Bank, for example, is an AI-powered mobile app that helps users identify types of recyclable materials and provides information on how to recycle them properly. It also sends personalised recycling reminders to users based on their location and waste collection schedule in their area.

Gamification is a technique that uses elements and mechanics of games to motivate and engage people in non-playful activities such as work or learning. Thanks to gamification, creating an engaging and fun experience that encourages people to actively participate in an activity, achieve specific goals and improve their performance is possible.

Artificial intelligence (AI) can improve the gaming experience and customise game mechanics based on users' preferences and habits. In addition, AI-powered games can be designed to raise awareness about important issues such as recycling and waste reduction.

AI-based games make it possible to create an engaging and interactive experience that can incentivise people to change their behaviours positively. For example, a game might reward users who recycle properly or reduce waste, increasing awareness of these activities' importance.

Gamification can be an essential strategy to motivate people to participate in an activity and improve their performance actively. AI can further enhance this gaming experience by customising game mechanics to users' preferences and creating games that raise awareness about important issues such as recycling and waste reduction.

A possible application of gamification in municipal waste management could be to encourage people to recycle correctly through apps or games that offer prizes or awards for the correct disposal of waste. In addition, a scoring system or ranking could be created among the various households or neighbourhoods of the city based on the amount of garbage adequately disposed of.

Gamification and artificial intelligence can be used to promote recycling and waste reduction. For example, the Catalan startup "Go Zero Waste" has created a platform that offers personalised challenges through an application in collaboration with local governments, schools and educational organisations with several objectives.

"Go Zero Waste" creates technological solutions to promote the reduction of residues through challenges with municipalities, companies and educational centres. In addition, the startup has launched a resolution to encourage the removal of residues and the local economy thanks to gamification.

The "Moving Towards Zero" platform combines the best of gamification and digitalisation into a flexible platform that helps transition to relevant behavioural changes. In addition, the platform uses artificial intelligence and green blockchain to achieve its goals.

The project allows the launching personalised challenges for a community or a group of people to encourage adopting new sustainable habits. In addition, the startup facilitates the technologies and tools necessary for the implementation of the campaign, including continuous technical support and department.

Adopting a zero-waste lifestyle can significantly benefit the environment by reducing waste in landfills or at sea, reducing the environmental impact of waste production and disposal processes, and promoting the circular economy.

4. AI, Green Nudging and Ethical and legal implications

Green nudging is a technique that uses subtle interventions to push people towards sustainable behaviours, but using these techniques raises some ethical implications.

For example, visual nudging could be considered manipulative and restricts people's freedom of choice. In addition, the effectiveness of nudging techniques depends on people's ability to decode people's emotional world, which could raise concerns about data privacy and security. However, encouraging techniques can help promote sustainable behaviour and improve the environment's and society's well-being. In addition, integrating nudge into European policies has been recommended as a support tool for fostering sustainable behaviour.

Using nudging in public policy raises ethical and legal implications that must be addressed at the political level.

Nudge projects aim to improve people's decisions by changing how options are presented rather than changing the choices themselves. However, some argue that nudges are unethical because they overextend government control to behaviours that should not be controlled. The effectiveness and ethics of nudge politics are also debated, as they capitalise on psychological insights into human behaviour to inform central policies. Ethical issues largely depend on whether nudges promote or undermine people's autonomy and freedom of choice. Therefore, it is essential to address the practical and ethical issues of nudging in public policy, considering the complex moral, social and cultural problems of unconscious influence.

L'introduzione dell'intelligenza artificiale (AI) e del green nudging ha aperto nuove opportunità per migliorare il nostro mondo dal punto di vista ambientale, ma anche ha sollevato preoccupazioni riguardo alle implicazioni etiche di queste tecnologie.

To address these ethical concerns, experts suggest developing moral norms governing the use of AI. These rules should include transparency, consent, accountability, fairness and privacy. For example, AI should be transparent in data collection and processing, and those involved should be able to consent to use their data. In addition, organisations that use AI should be accountable for AI's actions and ensure fairness in data processing.

Green nudging can interfere with people's free will, pushing them to make specific choices rather than leaving them free to decide. In addition, green nudging can promote particular ideologies, creating social pressure based on what is considered "right" or "wrong". This can lead to a lack of respect for diversity of opinions and values.

Artificial intelligence can raise ethical concerns about data privacy and security. For example, machine learning and data analytics techniques can allow organisations to collect sensitive personal information about their users and use it for improper purposes, such as discrimination or manipulation. To avoid these risks, strict ethical standards and laws that protect the privacy and security of user data are needed.

In addition, using artificial intelligence can also raise concerns about moral responsibility and liability. For example, suppose AI is used to make crucial hiring, lending, or holding decisions. In that case, there may be a risk that decisions will be influenced by bias or errors in the algorithm without human responsibility. In this case, regulations are needed to ensure transparency and accountability in decisions made by AI.

Nudging, on the other hand, can raise ethical questions regarding manipulating human behaviour. Nudging is based on the fact that people are influenced by small changes in their surroundings, such as advertisements or default choices. Although nudging can promote positive behaviours, such as physical activity or energy saving, it can also manipulate people's choices without consent. To avoid these risks, ethical norms and laws are needed to guarantee transparency and informed consent in using nudging.

5. Conclusion

In Italy, the waste recycling rate is the highest in Europe, reaching 83.2% of total waste, which is more than double the European Union average and higher than all other large countries, such as Spain (60.5%), France (54.4%) and Germany (44%). Moreover, Italy is one of the few European countries that, despite already a high recycling rate, improved its performance between 2010 and 2018, with an increase of 8.7% (Repubblica, 24 November 2022).

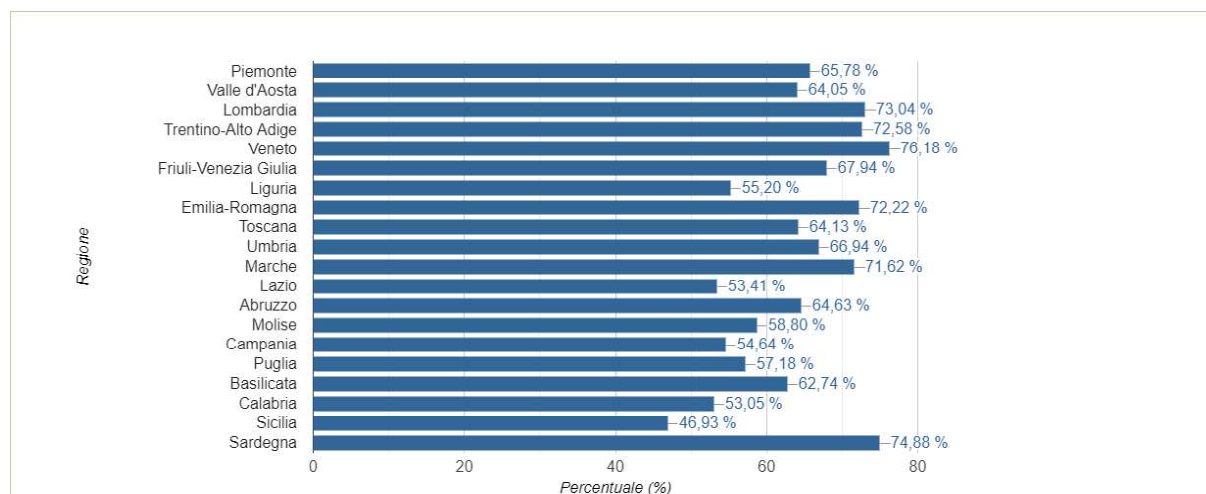


Fig. 4 Refreshing graph of the percentages of recycled waste for Regione.in Italy, data for the year 2021

In particular, the city of Treviso, with 88%, ranks first for the amount of recycled material for provincial capitals, while the city of Genoa, with 39.92 % (Data from the Liguria Region – Environment Sector), is far below the Italian average.

The factors that determine this result are many: from the logistical difficulties in waste management given by the conformation of the city itself, squeezed between sea and mountains with a lack of space for plants able to deal with the size of waste flows of a large city, to the problems of involving the local population in recycling practices.

For these reasons, in a situation like the one in Genoa, nudging practices combined with AI can offer the active involvement of citizens in waste management practices: the urgency of finding solutions that provide a significant improvement in awareness and education not only in schools to young people but

methods that can also reach the adult population and that rapid trigger results in the choices for recycling.



Fig. 5 Images of recycling and waste collection centres of AMIU city of Genoa.

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