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Participatory Design and Public Policies: The Case of the General Regional Waste Plan in Valle d'Aosta (Italy)

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Abstract: Waste management is one of the most strategic areas of regional policy planning. The impact of decisions such as the allocation of industrial waste treatment plants and waste collection strategies can affect the economic structure and quality of life of territories. The effectiveness of regulatory and organisational arrangements of Regional Waste Plans is linked to the availability of technologies and material infrastructure, but also to social consensus and behaviours. On this level, participatory planning conducted through foresight techniques plays an increasing role. The article presents an innovative case carried out in Valle d'Aosta in 2021, with the aim of promoting the participatory methodology experimented and the institutionalisation of such applications in strategic waste planning processes. The process involved 35 different stakeholders (unions, businesses, schools, trade, environmental associations, etc.) in structured consultations based on the principle of building a shared transition to 2030. In particular, the project was effective in broadening the participation of civil society in the area, in making the plan's objectives more ambitious, and in fostering the creation of a collaborative network between public, market and third sector actors.

Keywords: urban waste management; regional planning; participatory foresight; stakeholder engagement; public policies; door to door; zero waste

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1. Introduction

Waste management is a public service with a high environmental impact and significant socio-political implications.

Twelve of the 17 UN SDGs for 2030 can be traced back to aspects of waste management [1]. The directives that the European Commission has so far approved on the topic of the circular economy are almost entirely dedicated to increasing separate collections and regulating a market for secondary raw materials [2]. In Italy alone, the waste sector generates an added value of around €12 billion with the involvement of over 100 thousand workers [3].

However, waste management is also a social field marked by divergent interests and visions where alternative ideas, technologies and organisational models confront each other [4]. Street bin collection or door-to-door, incineration or material recovery, capital or job-intensive organisational models are all socio-technical apparatuses, which, whilst not mutually exclusive, nevertheless prefigure diversified visions of social relations.

To decide, in waste matters, therefore means strongly affecting the future of a territory/city. This makes waste management an area where the capacity to aspire [5,6] of several social groups are compared. The capacity to aspire can be defined as a competence to represent one or more desired futures with respect to a specific topic, and to describe how to realise them.

Strategic foresight is an action-research field aimed at organising and cultivating the capacity to aspire [7] Foresight is also a transdisciplinary and applied approach, which over the years has developed a set of techniques to facilitate the interchange of knowledge between social actors with different types of capital. Now it is a recognised practice at both

the academic and institutional level, as evidenced by the presence of a Competence Centre at the Joint Research Centre of the European Commission.

The subject of this article is the description of the drafting process of the Valle d'Aosta General Regional Waste Plan (GRWP), which saw the experimental use of a participatory foresight method, the Three Horizons (3H), to determine objectives, strategies and plan instruments, whilst listening to the 'voice' of various stakeholders. The GRWP is one of the apex instruments of regional waste management planning. It contains fundamental guidelines and strategies for the governance of municipal and special waste and for reclamation operations.

The objective of the article is to analyse the impact of foresight in the drafting of the GRWP by describing the results achieved by the experiment in terms of policy recommendations to the public actor.

The article is structured in the following sections:

- The first is dedicated to focusing on the scientific literature, particularly the sociological literature, that has analysed waste management and the application of foresight in public planning processes;
- the second describes the structure of the GRWP and the characteristics of the technical-administrative procedure adopted by the Valle d'Aosta Region;
- the third illustrates the characteristics of the foresight method used and its application in the Valle d'Aosta context;
- the fourth reconstructs the main achievements of the process with regard to waste reduction, collection and treatment;
- the fifth finally illustrates the main output of the process, which inspired the final GRWP report, namely the identification of objectives and expected results.

2. Previous Research

The impact of participatory planning in waste management, has been observed by a wide interdisciplinary literature. In this section, three strands of research are summarised; two were developed in the field of sociology of the environment and territory, particularly in the last twenty years, whilst the other one is related to the observation of participatory foresight practices in regional or urban planning processes. The first strand gathered around the analysis and description of the *engagement* processes of civil society or scientific and professional expertise. In particular, the power dynamics between social actors in different capacities involved in the processes of converting collection systems or building waste disposal infrastructures have been explored. In these studies, the protagonism of civic networks, environmental and voluntary associations, in the co-design of services emerges [8], especially in experiences of citizen involvement in neighbourhoods at high social risk [3,9]. Studies can also be associated with this strand, those of Pellizzoni [10] on the engagement of scientific expertise in the evaluation and legitimisation of waste treatment plants, and on the social and cultural consequences of processes of politicising knowledge.

The second strand of study was devoted to analysing the structure and dynamics of environmental conflicts. It is indeed in these events that participatory planning emerged either as a late practice (to 'compensate' for the environmental impact of a waste treatment or disposal infrastructure) or as explicitly missing. The most relevant contribution of these studies relates to the analysis of bottom-up mobilisation processes and argumentative strategies in conflicts. Territorial disputes about the siting of incinerators and landfills, or during waste emergencies, have encouraged public institutions to include periods of structured consultation and listening to the population in their waste plans. Although very different in terms of their contextual starting conditions, several case studies have been observed in Italy, often related to incinerator plans: from Acerra [11] to Trento [12], from Turin [13–15] to Parma [16].

The critical analysis of these contributions allows the emergence of two knowledge gaps. The first concerns the absence of systematic methodologies in structuring the participation process. The risk of participatory planning is in fact that it is confused with a

generic and improvised consultation and exchange of opinions between administrators and citizens. Participation, if it is to be effective, instead needs timely design, capable of anticipating selfish or extractive behaviour on the part of the actors and promoting the interchange of knowledge. The second concerns the focus on a fundamental phase in the construction of strategic design, which nevertheless sometimes does not receive due attention: the choice of who participates in the working tables. Several issues emerge, such as the relationship between experts and non-experts, the presence or absence of public administrators and decision-makers, and the influence of lobbies.

This is the reason for which foresight can be a valuable source of methods useful for addressing the participation's design and to manage the differences of power between stakeholders [7]. Some contributions have focused on application experiences in specific sectors of urban governance and economy, though rarely on waste management. This is the case of experiments in the field of safety and prevention on floodings [17], manufacturing industry and management of tourism after COVID-19 [18,19]. Other contributions have applied scenario planning methods to multilevel development policies, in particular at an European policy level [20]. Foresight techniques have been adopted as a policy-making method in the programme Horizon Europe 2021–2027. Five mission boards were established to develop visions and missions for the future of the Union, including two specific boards on climate-neutral cities and circular economy, where waste management was one of the most important issues considered.

This article is therefore intended to fill these many gaps: (i) to expose a method to organise in a structured way the participation process; (ii) to give suggestions and insights about the selection criteria on stakeholders' engagement and focal issues; and (iii) to enrich the literature on foresight in the field of waste in order to promote its use for better strategic planning at regional level.

3. The Context: Normative Aspects and Political Demands

With a surface area of 3263 km^2, Valle d'Aosta is the smallest region in Italy and, with its 124,041 resident inhabitants, also the least populated nationwide. Its territory is entirely set in a mountainous context, characterised by dozens of small municipalities and a single urban area consisting of the capital municipality, Aosta, with about 35,000 inhabitants.

Alongside the geographical context, the regulatory and political-administrative context deserves in-depth study. In fact, the Regional Plan is not an initiative of Valle d'Aosta, but a planning tool provided for by Community and national legislation, which is integrated in the regional competences, and in particular, in the case study observed, in those of a Region with a special statute. In relation to the participatory procedure, there are gaps in the legislation that inspired the emergence of a political demand and thus the realisation of the case study.

According to Directive 2007/98 EC, waste management plans must include an analysis of the existing provision in the geographical area concerned as well as the measures to be taken to improve environmentally sound re-use, recycling, recovery and disposal of waste, and an assessment of how these plans will contribute to the implementation of the objectives and provisions of the Directive.

The GRWP is the apex instrument through which regional authorities apply the Directive on waste management planning. It contains fundamental guidelines and strategies for the governance of municipal waste, special waste and reclamation operations. In particular, article 199, paragraph 10, of Legislative Decree 152/06 (transposition of paragraph 1, art. 30 of Directive 98/2008/EC) requires the regions to assess the need to update the Plan at least every six years.

In Aosta Valley, the GWRP, first approved in 2003, and updated in 2015, is being updated again with a six-year time horizon (2022–2026). The GRWP consists of four volumes that elaborate on the guidelines adopted by the Region over a five-year time horizon on: (i) municipal waste management; (ii) special waste management; (iii) reclamation of polluted areas; and (iv) identification of sites for waste treatment and disposal. In addition, the

GRWP provides for an environmental report, where the possible impacts of planning are analysed against the environmental sustainability objectives set at EU and national level.

In each of the volumes, the planning includes an outline of the existing situation, describing, for example, the method of calculating recycles performances of municipalities adopted at regional level, data on the quantitative and qualitative production of waste by geographical areas or product sectors, the characteristics of existing treatment plants and the condition of mobility infrastructure, and the formulation of scenarios with respect to the planning time horizon (5 years).

In relation to participatory planning, the GRPW provides for SEA (Strategic Environmental Assessment). This procedure, in Italy, envisages that the authorities affected by the effects of planning should express themselves through an opinion on the draft Plan within a defined time frame, i.e., 60 days. However, the rule does not explicitly provide for the ex-ante involvement of those subjects that, without having the function of issuing opinions, are the expression of the institutional complexity of a territory and are strongly involved in the strategic choices on waste management, for example, environmentalist associations, professional orders, structures representing businesses and workers, the third sector, the world of education and training, and the University.

The request to articulate a more incisive participatory process was formulated by the Region and was accepted by the entity in charge of drafting the GRPW, the planning company E.S.P.E.R., which entered a partnership with the University of Valle d'Aosta, involving the University's professional expertise in foresight and participatory planning in public policy. The partnership provided for the drafting of a participatory foresight project that was submitted to and approved by the regional authorities and applied during the GRPW drafting phase (between January and July 2021).

4. Methods: Characteristics and Application of Three Horizons

The project involved 35 organisations from different spheres of regional civil society in a series of three online workshops. The focus of the meetings was on three key topics for GRWPs such as waste reduction, collection, and treatment strategies. The 'forward-looking' look was directed towards 2030, the reference year of various international programmes, including the UN Sustainability Goals, and the year in which it might be possible to observe the effects of the current GRPW update (2022–2026).

The method chosen for the prior consultation process of the GRWP is the Three Horizons. This is a method developed at the International Futures Forum (UK), through which one works on the identification of current assumptions about the current system, emerging changes, possible and desirable futures, and the possible impacts of discontinuities and 'surprises' (so-called 'black swans' and 'wild cards').

In detail (see Figure 1), the method invites attention to three different time horizons, which in their rise and fall define the path of a transition from a problematic state to one of resilience.

In the articulation of the method, it makes sense to start with Horizon 3, i.e., what emerges at the end of the time frame and represents the desired future. Participants are called upon to implement their sociological imagination to describe what waste management would be like if "things had gone well" according to their point of view. Participants are asked to explore a wide range of new possibilities and to describe them as if they were already implemented and thus capable of producing a certain type of impact.

The second step concerns the 'present' and the definition of Horizon 1. The groups describe, from their own subjective perspective, a snapshot of the topic under discussion, with the aim of conceptually organising a map of the characteristics of the current scenario, including the more blurred and uncertain aspects, or elements of concern.

The last step is focused on strategic actions, and is Horizon 2, the one where the actions that enable the transition are put in place. Participants are asked to look in both directions: on the one hand, the current situation, to unearth 'signs of the future', i.e., weak signals indicating the changes taking place, and at the same time to identify 'limitations', i.e.,

barriers blocking innovations; on the other hand, the long-term future (defined in Horizon 3) is looked at, to identify discontinuities facilitating the generation of the desired scenario.

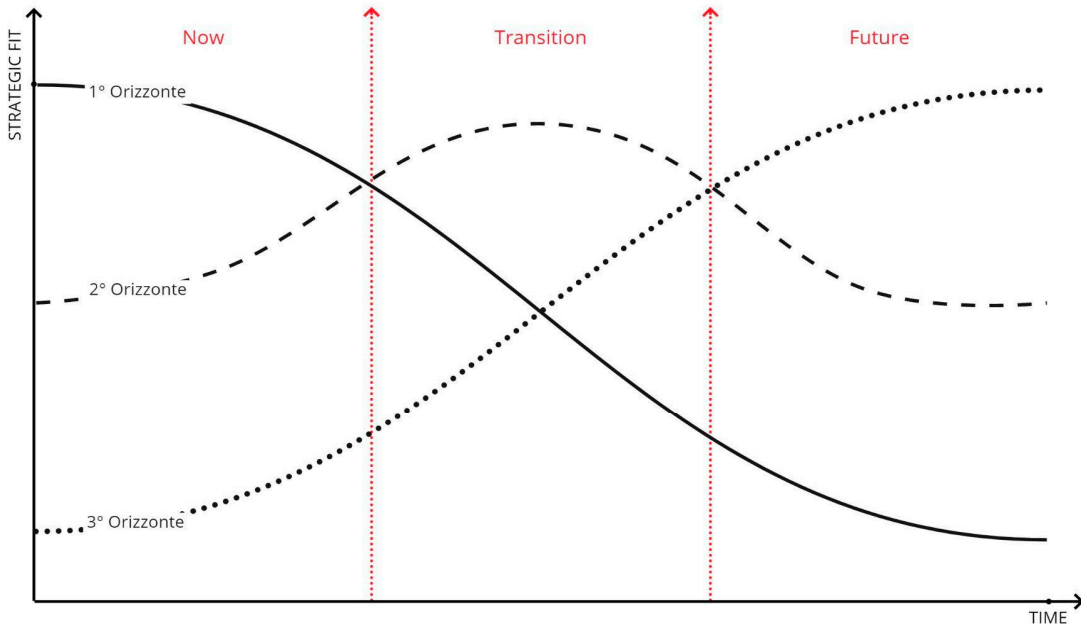

Figure 1. Own Elaboration of Three Horizons pattern.

The 3H experimentation within the GRWP saw an important preparatory activity aimed at identifying and engaging stakeholders. This activity was conducted in collaboration with the Valle d'Aosta Region, in order to recognise the widest range of stakeholders potentially interested in participating in the consultation, and whose contribution could be stimulating for the objectives set by the process. At the end of the contact phase, which started with 35 organisations, the availability of about 25 was obtained, with actual participation of 20, for a total of 45 different people actively engaged in the sessions.

The experimentation involved the organisation of three online workshops, each lasting 3 h, held on 8, 12 and 19 April 2021. Each workshop had a specific topic of reference: (i) reuse and waste reduction practices upstream of the collection processes; (ii) waste collection and transport activities; and (iii) facilities, technologies and organisational devices for waste treatment and disposal. The focus was only on urban waste management because it is the area where the involvement of local civil society is most intense.

The choice of dividing the meetings by themes was made in order to ensure that useful indications could be obtained on all the most relevant aspects on which the GRWP is called upon to regulate and give directions for the future. Some stakeholders—in particular local authorities and environmental associations—were asked to attend all three meetings. Other stakeholders, with a more specific commitment to one of the three topics, such as professional associations or some trade associations, were involved in one or two of the workshops.

The group work was organised in two different parallel sessions, where the participants met in the presence of a facilitator to carry out the steps foreseen by the 3H model. Finally, the last step of each meeting consisted of a "plenary" return where a representative from each parallel session, assisted by the facilitators, described the outcomes of the discussion.

The debate was synthesised by diagrams and Post-It notes elaborated on the Miro platform during the course of the parallel sessions by the facilitation group. Each of the three 3H passages were then 'filled in' with key words aimed at describing the thinking expressed by individual participants and building the basis for the development of as

shared a vision as possible. Below is a screenshot of one step (the preferred futures) of the schemes developed on the topic of waste treatment (Figure 2).

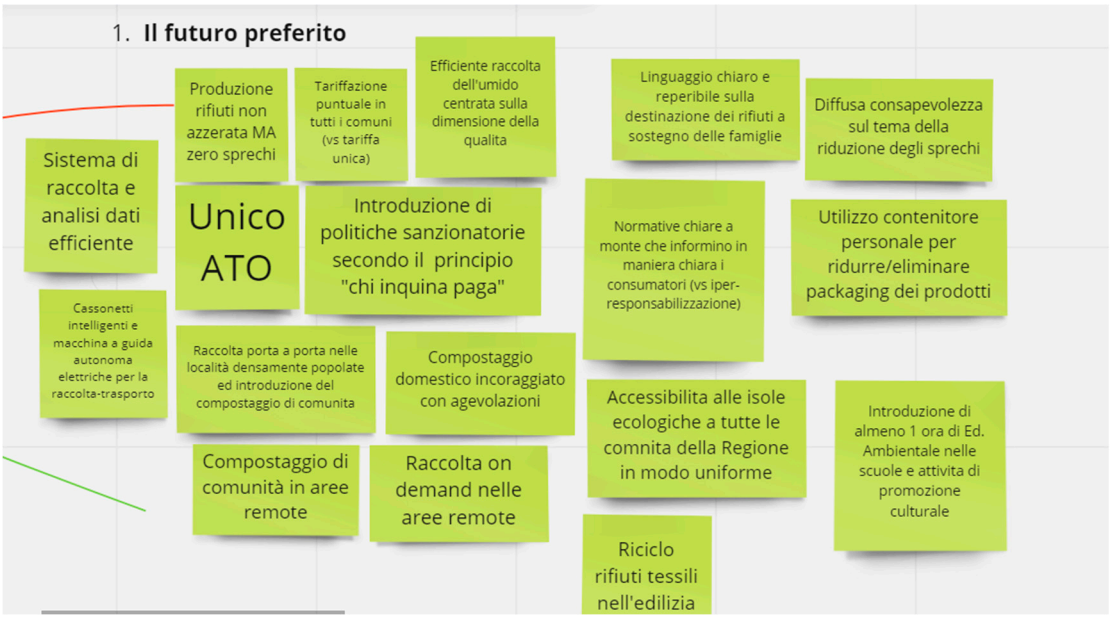

Figure 2. Screenshot of a Three Horizon application in GRWP.

The outcomes of each workshop were then compiled into a report, in which the facilitation group drew up narratives, i.e., written texts aimed at identifying, on the basis of the insights offered during the parallel sessions, objectives, strategic actions, and issues to be urgently addressed, and which is attached to this document. The reports were forwarded to all participants, who had approximately two weeks to conduct written observations and supplement what was reported.

As a result of the findings, three mission-oriented narratives were developed in this report, where the three workshop themes were reconceived as 'macro-challenges', and for each of them two missions were identified, a set of actors/sectors involved, and then the main actions to be carried out for their success.

5. Main Results

Below is a summary of the results obtained in the three workshops.

The complexity of the waste issue and some (expected) divergences recorded on the solutions to be adopted did not allow for a perfectly unanimous vision on the preferred future, but rather some trajectories considered most desirable and several bifurcations requiring a cultural and political choice on the part of the decision-maker. Furthermore, given the strong interdependence between the topics of waste collection, reduction and treatment, it was decided to aggregate the outcomes of the process according to three horizons: today's problems (Horizon 1), the preferred future (Horizon 3), and strategic actions (Horizon 2), to which Section 6 is dedicated, as a fundamental moment for the elaboration of policy recommendations.

5.1. Horizon 1: Today's Problems

The design identified elements related to administrative and industrial organisation, environmental culture, and the ability of regional and municipal political actors to build long-term policies as fundamental limitations of the current regional waste system.

The main elements that emerged concerned:

Performance indicators: the target of 65% recycling by 2026, suggested by the Region in the first consultations, while encouraging compared to past performance, is not ambitious enough (e.g., other Italian regions, such as Veneto, reach percentages of 75–80%). In

addition, the need to accompany the separate collection index with that of per capita waste reduction and recovery is highlighted, through which not only quantity but also quality of collections can be monitored;

Administrative fragmentation: a cause for concern is the presence of excessive fragmentation in the area authorities, of which there are five in Valle d'Aosta, in spite of a small number of inhabitants (about 135,000 throughout the region). This produces a disorderly system of rules and services in an area that instead needs more unitary guidance;

Disincentive tariff system: it is highlighted by the process that the current tariff system is inadequate to accompany virtuous waste management practices. For example, the tariffs for the treatment of undifferentiated waste at the regional plant are identical to those for residual dry waste from door-to-door collection. In general, undifferentiated waste has a lower treatment cost than organic waste and mowing, and the pre-treatment of plastic, which should yield a profit. This system disincentivizes door-to-door collection and facilitates the spread of collections based on molok or large bins, which inevitably lower the quality and quantity of differentiated waste.

Inadequacy of the new plant: the plant that the region is finalising for the local treatment of waste has been described by several participants as 'outdated': it is not able to treat on-site the organic waste that arrives from door-to-door collections, it only processes the undergrain from the shredding of undifferentiated waste, spending a lot of energy compared to what it produces, and it does not eliminate dependence on landfills. In addition, the plant under construction would not adequately sort the types of plastics for their economic valorisation, nor would it solve the problem of sweeping soil, or of some waste—such as nappies and diapers—which, if recycled, would take the weight away from the undifferentiated waste. In fact, the plant still does not process a large part of the waste that is collected, sorting it on platforms outside the region.

Ownership. Different assessments emerged at the table with respect to the current governance model. According to one view, a greater presence of the public sector would be needed; the regional waste treatment plant is run as a monopoly by a private entity that earns more based not on the quality of the waste, but on its quantity (and would therefore have an incentive to ensure more waste existed). Added to this is the issue of the project financing with which the new TMB plant is being built, which will have a ten-year payback period and will therefore condition the collection systems for the future.

5.2. Horizon 2: Six Missions for the Aosta Valley GRWP

Horizon 2 of the participatory design was summarised in a policy recommendation scheme, partly also inspired by Mariana Mazzucato's (2018) concept of 'mission-oriented policies'. This scheme consists of: (i) the identification of a grand challenge; (ii) of operational missions; (iii) of sectors/actors directly involved in the missions; (iv) finally, the identification of strategic actions, in some cases the responsibility of the public actor, in others of the other stakeholders. Regarding the macro challenges, in the case of the GRWP they concern the three integrated processes of waste reduction, collection and treatment, which are connected to several UN SDGs (Sustainable Goal Development), and in particular to Goal No. 11 'Sustainable and Resilient Cities' and No. 12 'Ensure sustainable patterns of production and consumption'. Below (Figure 3), an outline of the elaboration with respect to the macro-theme of waste reduction is presented.

Waste reduction has two missions. Today, the most virtuous municipalities and regions in the field of waste management have a quantity of undifferentiated waste produced of 70 kg/year/inhabitant or less. Currently, Valle d'Aosta is around 190 kg/year/inhabitant. As far as waste in general is concerned, Valle d'Aosta has an increasing figure of around 604 kg/year/inhabitant, when the most virtuous Municipalities and Regions have much lower values (523 kg/year/inhabitant in Veneto, 520 kg/year/inhabitant in the Province of Trento).

A hypothetical scenario for 2025 for Valle d'Aosta sees a significant reduction in undifferentiated waste, in line with the provisions of Decree Law 116/2020, equal to −50%,

with a reduction in quantity of about 13,000 tonnes. The reduction cannot, however, be fully compensated by separate waste collection, in the 'zero waste' perspective, where the recovery of matter is considered a virtuous practice, but subordinate to the objective of producing no waste.

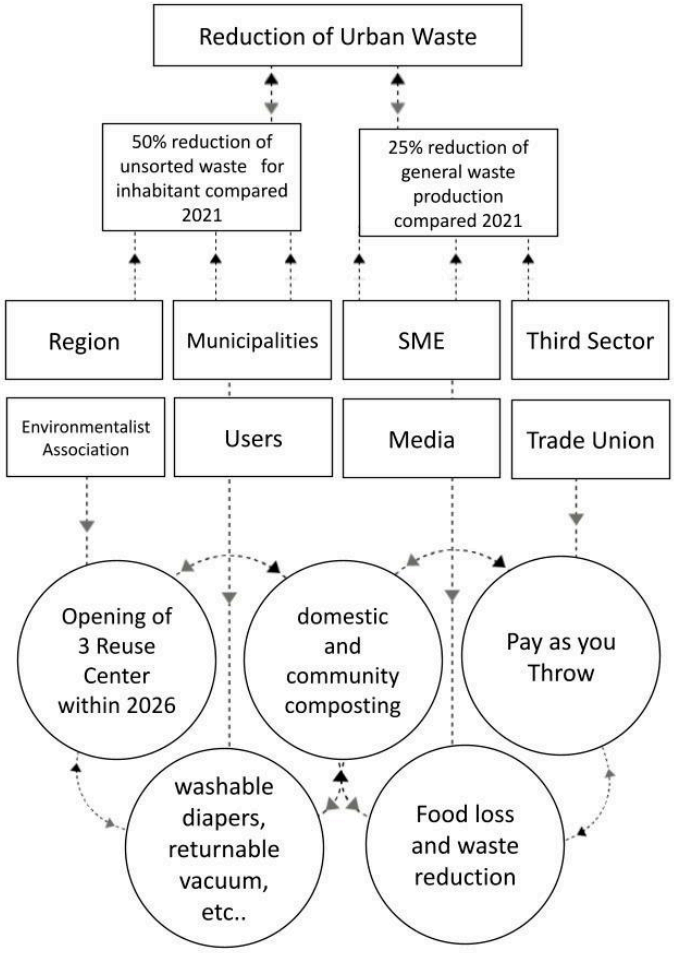

Figure 3. Missions on reduction of waste pillar (GRWP, 2021).

In relation to waste collection (Figure 4), the missions reflect the expectations repeated by many participants and reiterated by regulatory forecasts, albeit with a shorter time horizon and therefore being more challenging.

The missions have an impact on both the quantity and the quality of separate waste collection. On the one hand, there is the objective of achieving a DR percentage of 80%, an objective that seems attainable if one considers that Valle d'Aosta already has a rate of 65%. However, the quantitative objective is correlated with the qualitative one, reported to be the real problem by many participants. The recycling index indicates the quantity of separately collected waste that actually goes for recycling: today, several fractions, in particular multi-material, have significant percentages of impurities. A very important percentage of potentially recyclable waste is also to be found in the residual dry fraction and especially in undifferentiated street waste. The actors involved in both missions range from regulators to those managing collection services, with a crucial role played by environmental associations, schools and the third sector in promoting a real 'social pact'. The strategic actions are those already described in the first Plan documents: pushing door-to-door differentiated collection in all Valle d'Aosta municipalities, providing on-demand collection services in those territories which, at least for part of the year, have quantities too low to justify a daily collection service, overcoming street collection models and the use of

moloks. The use of ecological islands with Rfid should also be rethought as a supplement to, and not a substitute for, systems based on door-to-door collection.

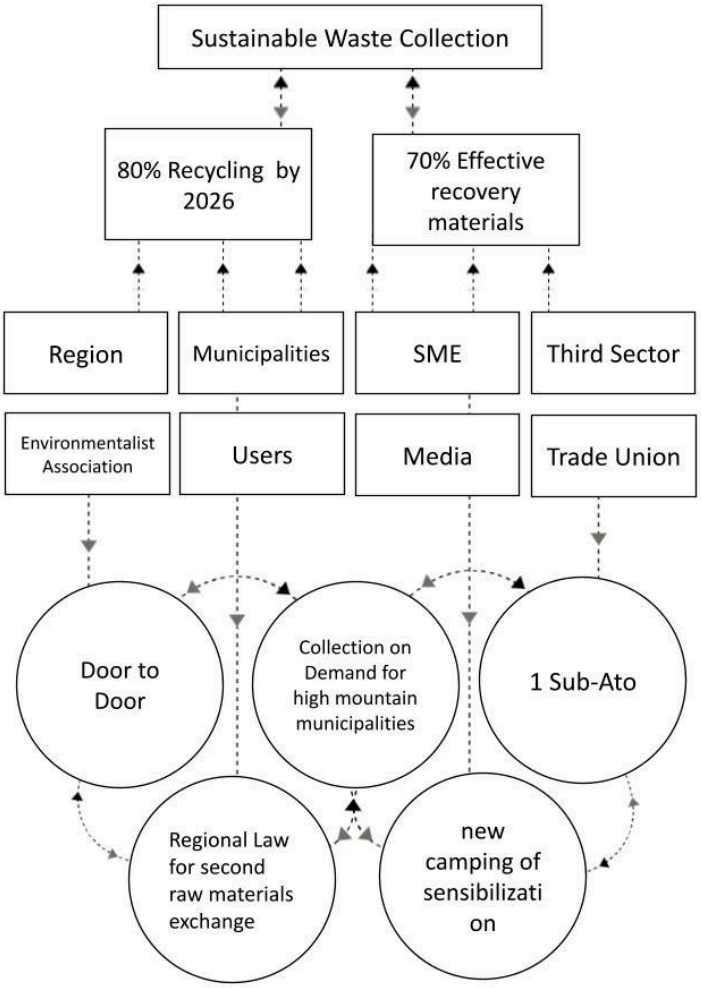

Figure 4. Missions of separate waste collections (GRWP 2021).

The macro-challenge concerning waste treatment is to be responded to with two objectives that are strongly diffused in the imaginations of the participants (but not for this reason, with few divergences with respect to the modalities of implementation): the achievement of a functional autonomy of the Aosta Valley on the treatment within its borders of its own waste, and that of a definitive emancipation of the territory from the regional landfill (Figure 5).

On these two missions there is a path dependence with respect to the path taken so far by the political decision-maker on the plant under construction and the model of governance and ownership (concession to the private sector through project financing). However, the margins for a significant improvement over the current condition still seem more than feasible. The issue of regulating the tariff system for access to the Brissogne plant, the regional landfill, in a different way emerges strongly from the exercise. First of all, a strongly disincentivizing entry tariff should be set for undifferentiated waste, which could be diversified on the basis of origin (whether from door-to-door or roadside) or simply on the basis of the degree of impurity of the inputs. This measure is also seen as the gamechanger of transformations in collection, since today door-to-door collection seems to be strongly disincentivized by lower landfill costs than organic waste treatment. A higher taxation of undifferentiated waste should, however, be accompanied by a more encouraging incentive system for local authorities that deliver profitable waste fractions, with the Brissogne plant operator offering solutions other than single access tariffs, whereby

a flat rate is charged between "debit" waste (such as organic waste) and "credit" waste (such as plastics, aluminium, selective paper fraction).

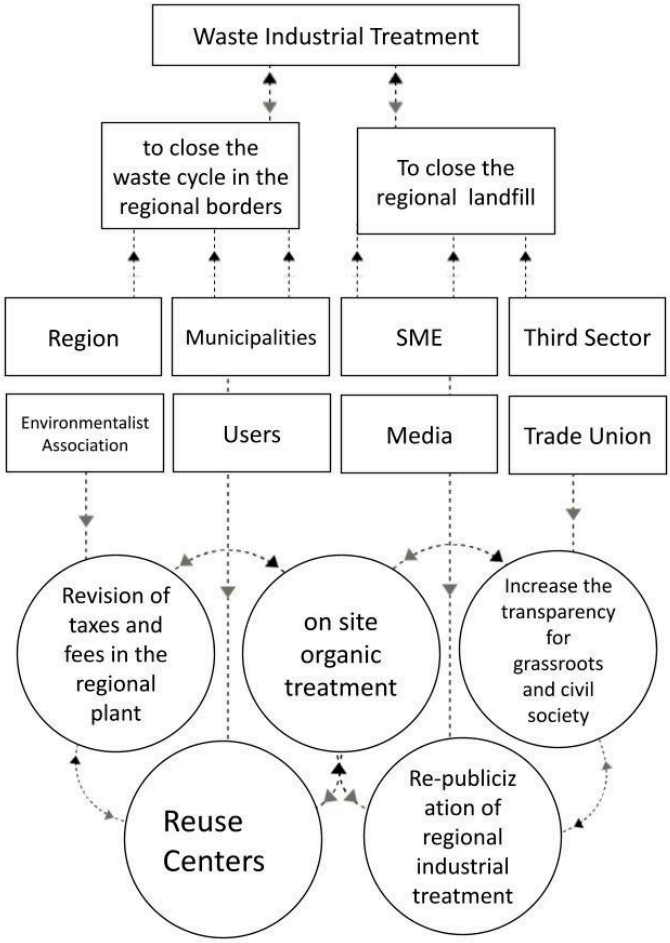

Figure 5. Missions on Industrial Treatment of Waste (GRWP 2021).

Related to this issue is that of the so-called 'passing obligation' at the Brissogne plant. The overall logistics of waste transport to the platforms should be reviewed. While centralising the transfer of certain types of waste in Brissogne may make sense from an economic point of view (avoiding the burden of inter-regional transport to small municipalities), it certainly does not from an environmental point of view, and for several Unités it may also be more convenient to organise transfer stations closer to each other. This reinforces the need—while keeping an eye on the intraterritorial differences in Valle d'Aosta—for a single brain to define services and cycle management techniques, a solution that leads towards the establishment of a single ATO for the entire Region.

5.3. Horizon 3: The Preferred "Futures"

The 'preferred' waste management that emerged from participatory planning is embedded in technological and infrastructural devices, but also in social practices.

Composting: The practice of home and community composting plays a fundamental role. It is a waste reduction practice that embraces not only food waste, but also clippings and prunings, which are unanimously considered by Valle d'Aosta stakeholders as one of the most serious environmental emergencies linked to this type of waste, because they are often subject to uncontrolled burning.

Reuse Centers: One of the most frequently mentioned tools are the Reuse Centres. These are infrastructure locations with large indoor spaces (former industrial warehouses), often managed by cooperatives and social enterprises, where a part of the waste stream

that would otherwise end up in landfills or non-local treatment circuits (e.g., bulky items or WEEE) is intercepted and put to value again. Very often, in fact, this type of 'waste' is a product with a long life cycle that, with little and sometimes no maintenance, can be put back into a circuit of use. The working groups therefore imagine that in 2030 such centres will be present in the region and spread out in strategic locations to serve the various side valleys.

Reuse of food waste: In 2030, the participants imagine the presence of a network made up of public bodies, companies (in particular large-scale retail trade), and private social actors, who cooperate to have leftover food distributed in canteens and supermarkets to associations working to combat absolute poverty. This activity is imagined to be voluntary, but also supported by regulations that tend to tax or introduce disincentivizing mechanisms in the event of non-membership of the network by waste producers.

Pay as you throw (PayT): By 2030, PayT has been successfully implemented in almost all territories in the Valley, with an increase in the collection rate from 65 to 80 per cent and an increase in the recycling rate of at least 70 per cent, with a reduced extraneous fraction. The principle that the 'polluter pays' is strongly shared by the participants, although some express concern about waste abandonment, and therefore believe that a PayT scheme should be adopted together with stricter regulations on controls.

Door to Door + On Demand: In 2030, the collection model used at regional level is exclusively door-to-door collection, supplemented by on-demand collection for municipalities with a very low population density. The latter system envisages the possibility for citizens to notify the operator by text message of the delivery that has taken place, thus avoiding ordinary collection rounds with little waste to be collected.

Awareness-raising. In 2030, the overall perception of the waste problem by individual citizens is also changing. At school, there are hours dedicated to environmental education in all classes, some of which are specifically dedicated to the topic of waste. In 2030, another well-established target of awareness-raising processes are the elderly, in order to inform them properly of where to dispose of waste. This has been made possible by a new, more widespread and structured media campaign and the adoption of good waste disposal support systems (through the dissemination of free electronic apps already available on the market).

6. Discussion

What kind of future emerges from the participatory process? What insights can be used from the experience for future planning processes in the field of waste?

We try to answer these two questions, through the following two subsections, in which we offer a commentary on the results obtained from the process and the reinforcement between them and the objectives we have set with this paper.

6.1. The Future of Aosta Valley Waste Management: A Zero Waste Perspective

From the results of the participation process, the Zero Waste model emerges [2,3] as the dominant representation of the future, which has the ambitious goal of reducing, to the point of eliminating, the concept rather than the object of waste. It is significant that there was a strong homogeneity of views on objectives and strategic actions among the participants, and that this vision was shared by environmental associations, business associations and trade unions, as well as administrative and political parties.

The influence of Zero Waste as a symbolic universe of reference is evident in the analysis of the organisational, technological and infrastructural devices proposed by the participatory process to the GRWP designers, such as punctual pricing, home composting, permanent environmental communication and activation of a secondary raw material's regional market.

Punctual pricing is considered a priority action. According to participants, PayT models, where tested, have shown an extraordinary capacity to reduce waste production. The concerns expressed at times in the workshops on the risk of waste abandonment must

encourage the Region and the local authorities, according to their respective competences, to identify adequate regulation (and sanction) systems, and certainly not to postpone the adoption of this practice. Such positive practices are already widespread in the Province of Trento and in other territorial realities that can be compared with that of Valle d'Aosta. It is also in this perspective that measures aimed at spreading home composting, which is still too little widespread in Valle d'Aosta, are particularly urgent, given the extraordinary opportunities constituted by the relationship between nature and urbanisation, and the mass-scale spread of part-time farming.

A fundamental role must be played by communication and awareness-raising. The participants' impression is that the waste issue in Valle d'Aosta is not sufficiently at the centre of the local political agenda, except in the most superficial forms of 'tax'. Here too, the GRWP was called upon to devote an ad hoc space to the impact of communication, and indicate some good practices to be adopted so that the information process is coordinated by the regional authority, in collaboration with local authorities, schools and the third sector. According to a well-established standard in many efficient waste collection and treatment services, no less than 5% of the total expenditure on waste should be allocated to information and communication processes.

Another particularly delicate but urgent issue is that of the involvement of the regional innovation system in promoting integrated public-private solutions to the management of the growing demand for secondary raw materials. One idea which emerged during the process is to integrate the GRWP and the Smart Specialisation Strategy (2021–2027) by foreseeing an ad hoc research-action line on the subject, also involving public capital entrepreneurial actors such as CVA, as well as private business networks, which after decades of region-centric management of the local economy are finally structuring themselves independently from the support of 'Mother Region'.

However, the Zero Waste perspective clashes with 'legacies' of the current organisational system that, although in decline, compromise the implementation of the innovations formulated by the participatory process. This is the case of the Brissogne plant, the most important industrial treatment infrastructure of the territory.

The participants underlined that, if the Region wants to set itself the goal of closing the waste cycle as much as possible internally, it will necessarily have to review the infrastructural condition of the Brissogne plant. The lines under construction respond to a vision of the waste cycle still strongly focused on the production of undifferentiated waste. The sorting plant for the multi-material stream goes in the direction of increasing the selective capacity downstream of the process, when many workshop participants emphasise the opportunity to focus on the willingness of citizens to separate types even more accurately, if there are environmental and economic gains to be made. There are no plans for on-site treatment of organic waste, which will therefore continue to travel to neighbouring regions where availability is available. The margins of operability on the transformations that can be carried out on a project bound to the obligations of impact finance in the presence of a ten-year concession with a private subject (winner, therefore, of a public evidence procedure on the basis of a project defined by the Region) from this point of view seem very marginal, but the GRWP should at least lay the foundations for a new organisation in the medium term.

6.2. Insights and Limits for Further Applications

The impact of the process on the objectives and missions identified in the Plan has been remarkable. The Region has decided to adopt PayT and door-to-door throughout the territory by 2026, to simplify the administrative organisation with a single management Area, and has accepted in its performance indicators, those proposed by the participants regarding the percentage of material recovery in conjunction with the indicator of recycling.

At the same time, the project suffered from limitations that affected its broader effectiveness.

A first critical element was the budget: the investment for participatory planning was 5 percent of the total amount disbursed by the region for the drafting of the Plan, when a

benchmark standard for such activity should be at least double that amount. In fact, the process, in order to be best executed, requires the presence of various professionals, from process designers to facilitators, and the scarce economic resources available led to the involvement of volunteers, especially in the management of the working tables, which inevitably affected the quality of the returns.

A second critical element was the internal political conflict within the region, which led, during the process, to the resignation of the regional councillor for the environment, the main supporter and animator of the participation process. This reduced the regional political body's attention and interest in the process and diminished its effectiveness.

A third critical element was the absence at the working tables of political and administrative figures from the regional body. The public actors present were almost exclusively from the local university, regional derivative bodies such as environmental protection agencies, and municipal administrators. This was a choice on the part of the region due to political motivations (to prevent the working tables from becoming arenas for political debate), but it created a greater distance between the outputs of the project and those of the GRWP.

However, in spite of these limitations, mostly concentrated in the peculiarity of the application context, it is also possible to derive valuable insights for the future from the analysis of this case study.

One first in this study was the use of foresight as a methodological approach to stimulate knowledge exchange among stakeholders, even when planning a complex issue such as the organisation of waste management in a Region. Provoking a debate about the preferred future, namely the desired vision, helps stakeholders with different interests to make their goals explicit and find convergences. Stimulating the debate with analytical questioning about the limits to innovation, about the blocking elements of desired initiatives, helps and stimulates participants to come to terms with their own capacity for agency, to ask themselves what each of them can do to realise the desired vision. Finally, transforming visioning and analysing, into strategizing, then into a set of strategic actions in the short- and medium-term, is the right format for governments to dialogue with their code, which is made up of cogent missions and responsibilities.

A second aspect concerns the role of certain actors, such as the university, in guiding these processes, and in the effort to combine participation and research. Participation always requires, first and foremost, legitimacy; the actors involved must perceive the reliability of the subject leading the process, that is, they must be able to 'trust' him. The university can play this role of guarantor for public and private actors, as it belongs to it by 'third mission', a concept used to indicate the task of universities to dialogue with the territory and to contribute to its economic, social and cultural growth. The university's involvement in the management of participatory processes is also a guarantee of quality in the return of results, and in the possibility of using the good ideas that emerge in the debates to elaborate good strategies and impactful initiatives.

7. Conclusions

The GRWP was approved by the Aosta Valley Region, the 22 May 2022. The results of the participation process were discussed in the Regional Council and are the subject of a specific section in the Plan documents. Although limited in some circumstances, the Valle d'Aosta case study demonstrates that waste management is a social field in which to practise voice extension on change. Approaches that aim to observe such processes solely from the perspective of technology implementation risk activating conflicts from below and reducing the complexity of the issue to an issue of whether or not infrastructure is available. There are no innocent technologies, just as it is not possible to decouple technology from society; this is why it is useful to strengthen interdisciplinary skills and the meeting of hard and social sciences to improve the sustainability of initiatives taken by public and private actors.

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