

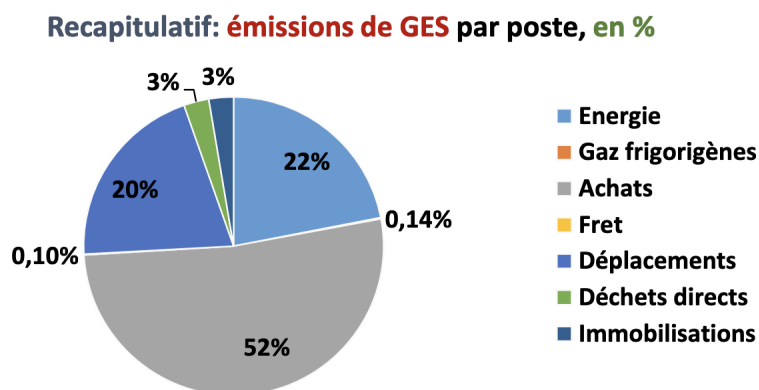
# How to Design an Effective Composting Program at Ecole Normale Supérieure: An Intervention Proposal

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## **Motivation/Objective**

Organic waste, such as food and garden waste, makes up a significant portion of trash thrown in the garbage bin when, if separated, it can be reused for nutrients. While food waste's detrimental impact on the climate might be overshadowed by other environmental concerns, such as reducing meat consumption, it has significant effects in the context of climate change, making it an issue which warrants attention and resources. Specifically, food waste contributes to three concerning changes in the context of the environment- climate change via greenhouse gas emissions, biodiversity loss, and pollution (United Nations Environmental Program). On this note, widespread environmental consequences associated with excessive waste have increased interest in composting as an effective solution to organic waste management issues. Indeed, composting is related to a host of environmental benefits, including reducing waste, improved soil health, energy production (Zero Waste France) keeping water in soil, reducing pesticide use, and allowing for the growth of sustainable food (Seven Generations Ahead). However, composting has an extremely low take-up, with only 5.5% of municipal waste being composted in 2018, while 40% had the potential to be used (Rastegari Kopaei et al., 2021).

In 2019, 10,540 tons of greenhouse gas emissions were generated by the École normale supérieure for its activities, excluding laboratories. This is the equivalent of driving a car around the world 125 times, or the annual consumption of 880 people. This value has been computed by dimENSion durable, a group of students, professors and staff that strive to reduce the carbon footprint of the school and preserve its natural resources. At ENS, 8% of greenhouse gas (GHG) emissions are related to the restoration, and 3% to the waste.



*Figure 1 : GHG emissions by sectors according to the carbon footprint estimated by dimENSion durable*

To address these environmental challenges, dimENSion durable created a number of working groups, among which “Collective and individual catering” and “Quality of life on campus and awareness of eco-gestures”. They set a goal to produce 6% less GHG emissions per year as well as less than 40% of GHG emissions by 2030 compared to 2019. They also aim for 100% of laboratories to complete their carbon footprint by 2024.

Eco-gesture awareness is already introduced at campus kitchens to some extent: the group set up posters encouraging pro-environmental behaviors such as “turn off the tap when you do the dishes” or “use a kettle to heat your water”. In the canteen, a scale to measure food waste was developed to provide statistics. Additionally, one day per week, only vegetarian meals are provided (according to the EGalim law which applies since november 2019 over every canteen in France).

To take action against food waste, ENS is conducting a poster campaign to raise community awareness. The posters indicate the number of kilograms of waste produced per week and per person. "Every week, we weigh the waste produced in the canteen. We get a figure per person, depending on the number of students in the restaurant. It's not so much the weight

itself that's important, but rather how it evolves over the year and how it fluctuates depending on the menu offered."

In parallel with this awareness-raising action, interventions are also carried out with the staff. "We have raised awareness among restaurant staff about the portions served, so that everyone can ask for what is best for them and be served at the right level of hunger," summarizes Dylan Colas, team leader of the *DimENSion durable project*.

Many students' propositions already rely on vegetarianism and mainly focus on the canteen, and the administration is actively working on it. Similarly, they are also working on building insulation. However, and despite the awareness about the food waste issue, very little has been done to tackle this problem. Yet, the *ADEME* found that 96 kg/pers./year of putrescible are potentially recoverable. That is why, inspired by the activity of three *DimENSion durable* working groups ("Waste", "Catering" and "Awareness of eco-gestures"), we seek to identify ways to reduce the environmental footprint of the ENS-PSL institution by outlining a multi-targeted approach with the specific aim of addressing the issue of food waste in kitchens. For example, while at Ecole Normale Supérieure, an awareness of the critical role composting plays in climate action has been accompanied by an attempt from the student's environmental association *Ecocampus* to encourage students to partake in composting activities; these efforts have revealed several problems with developing a working composting system. As ENS students, we know the strength of the *normalien* community and we believe that the composting system should be a full part of *normalien* habits instead of only being a container in *Cour Pasteur*. That is why, informed by new knowledge and tools and accounting for the challenges associated with composting, we aim to remedy these issues by proposing a behavioral strategy to

individually target the previously noted difficulties. We want to implement the composting system at the source of the students' waste: the kitchens of the boarding school, where around 700 ENS students live together. In addition to suggesting remedies to prior problems, we outline an approach that integrates improvements in areas untouched before. In light of previous composting efforts, we attempt to address these shortcomings to implement a long-term composting solution by providing suggestions that would make such an intervention more viable. Given that the food activities of students significantly impact the number of carbon emissions emitted, finding a way to reach and effectively communicate with students is necessary to make a positive change in the context of composting behavior. Indeed, encouraging sustainable environmental practices and helping people adopt more sustainable lifestyles will have far-reaching and lasting effects. Finding ways for people to stick to environmentally friendly habits is the first step towards making composting the norm.

### **Previous studies**

A few attempts have been made to use behavioral methods for encouraging the correct use of compost bins on college campuses. For example, in a 2020 study by Szczucinski et al., the research team tackled the problem of contamination in compost bins located at the dining sites on campus. Their solution was to change the design of the bins in dining halls: making them a stand-out bright green color, introducing a hinged door and adding a poster explaining what should and should not be composted. Compared to regular bins without any additional signs, the modified bins significantly reduced contamination ( $r=0.66 - 0.70$ ). The authors also highlight the high social validity and maintenance levels of their nudge, and suggest that with further validation, it can be implemented on a wider scale.

In Nguyen et al. (2022), an attempt was made to assess the main factors that predict the participation of households in sustainable management of food waste, including composting. A survey of 1027 participants showed that the key factors affecting individuals' practices include, from a practical point of view, owning a kitchen caddy, and from a psychological perspective, their perception of personal benefits from sorting food waste, general recycling habits and "environmental self-identity" – that is, to what degree a participant identifies themselves through leading a sustainable lifestyle. Those who estimated the inconvenience of food waste sorting to be stronger were significantly less likely to partake. The results of this study allow us to pinpoint a few behavioral obstacles that prevent individuals from adopting sustainable practices such as composting.

### **Behavioral Analysis**

Motivated to identify ways to identify viable composting solutions, we provide an in-depth analysis of the behavioral and structural dimensions of the composting situation at ENS. Here, we explore the practical behavioral issues and the consequences observed during previous composting efforts implemented at the ENS.

First, the individuals tasked with emptying the bins in the dorms were not doing so promptly. Two compost managers per floor were needed to empty the bin every 2-3 days and there were not enough people willing to do this.

Second, people made sorting errors, leading to contamination that impedes the ability to compost efficiently and effectively. These behavioral issues seem to center around people struggling to follow the behavioral steps needed to compost correctly. The crux of the problem, otherwise stated, appears to be a lack of follow-through. This could be due to laziness, lack of

time or motivation, a bias for the norm, or a misunderstanding about the correct procedures for composting.

An additional issue could be the fact not all people are aware of what composting actually is and how it can be beneficial to the environment, since the practice is not as widespread as basic waste sorting. Even though everyday choices are made based on mental shortcuts and a nudge can be effective without providing individuals with information on how exactly their actions are helpful, providing basic facts on how composting functions can have a positive effect on motivation by providing a rationale behind the proposed actions. While it may not be possible to ascertain the specific reasons for these shortcomings, it is possible to design an intervention which incorporates the individual and collective factors which may contribute to the documented behavioral failures.

At the structural level, the maintenance agents in charge of the compost also made sorting errors by merging the bags, leading to an impossibility to compost. It is because of a lack of signaling : in *Cour Pasteur*, the garbage bins that are supposed to collect organic waste are brown, leading to a confusion in sorting. Within the housing units, the administration believed composting was attracting pests and contributing to an unsanitary situation in the dorms. These beliefs are false when the compost is well-managed, using specific techniques like adding ground-material for smell issues. Moreover, the amount of waste will not change by adding a new bin, and because it will be emptied more frequently, we could even argue for a possible reduction in pests, that are anyway already well-implemented in every kitchen on the *Panthéon* campus. Therefore at the structural level, the main issues appear due to a lack of proper facilities, faith and organization. We will use several levers to fight these brakes, beginning with economical arguments. Indeed, the installation and maintenance around the compost does not

cost the campus much in funding (around 1000€ for 5 years) or even in human time, especially if the compost is managed jointly by the administration (*Service Patrimoine* and *dimENSion durable*) and a group of motivated users. Using reputation-management mechanism, we can also argue that implementing a composting system at ENS will display the school as pioneers in terms of waste valorisation and can lead to social media posts by the communication service.

## **Intervention**

### **Framework and steps**

Guided by the goal of changing composting behavior, our approach rests on the application of the EAST framework which states that a policy should be Easy, Attractive, Social and Timely. We suggest a proposal which highlights the importance of social norms in the context of composting and increasing knowledge of the composting procedure. In response to observed challenges, we provide some potential solutions. In accordance with our chosen framework, we will present the behavioral measures that we deem necessary to re-introduce an efficient composting system on the campus of Ecole Normale Supérieure.

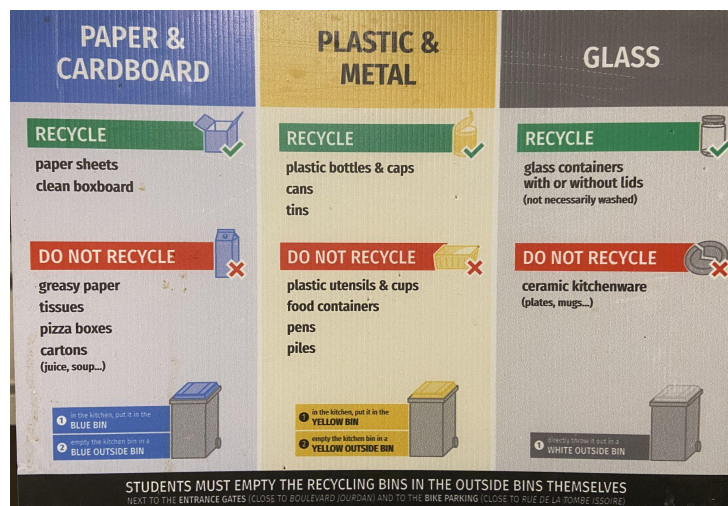
#### **1. Make it EASY**

Reducing the immediate cost of an action can greatly increase the number of those who would want to follow through with it (OECD, 2017). As charging each student separately with bringing their compostables into the *Cour Pasteur* bin requires a very high level of personal commitment, we propose to install a small bin in the kitchen of every floor, which would be regularly emptied into the bigger in-pile compost bin on campus. Another step to facilitate the composting process would be, in line with Szczucinski et al. (2020), to equip the compost bins (the ones in the kitchens and the Moulinot bins in *Cour Pasteur*) with posters explaining what



should and should not go in them, both in French and in English (see *figure 2*). The panel in *Cour Pasteur* should be addressed to the students but also to the maintenance agents to prevent any mistakes for all actors.

A



B



*Figure 2 : A. Posters that already exist in the kitchen. The idea would be to extend it with a new green bin dedicated to composting. B. Example of a sample poster that could be used, developed by the Réseau Français Étudiant pour le Développement Durable. We also suggest the use of icons to make the poster more readable.*

## 2. Make it ATTRACTIVE

The small kitchens-compost bin as well as the bigger tray in *Cour Pasteur* will be painted a bright color to attract attention and make it stand out against the other bins. Additionally, posters with short communications on the benefits of composting and an expression of gratitude towards those who partake will be put up in the kitchens near the bins. That will attach a positive value to the practice of composting and the praise will provide encouragement as well as a self-esteem boost, which is an important driving force behind pro-environmental behaviors. By

building a new student's pole (eg. the *Compasteur pôle*) that will work in collaboration with *Ecocampus*, we can spread our posters and messages online and therefore build an attractive image that can reach each *normalien*. An important step in increasing the attractiveness of participating in the composting program is providing a material incentive for participation. Encouragement with short-term personal benefits in the beginning of an intervention can be helpful in forming a habit, as immediate rewards are more strong predictors of sticking to long term goals than delayed gratification (Woolley & Fishbach, 2017).

### 3. Make it SOCIAL

Introducing game elements to pro-environmental interventions has shown efficiency (Ro et al., 2017), which is why it will be organized in the form of a competition, lasting for the first three weeks of the beginning of the school year. This duration choice is not random: it is a third of the median time necessary to create a habit (Laly *et al.*, 2009) but it allows immediate rewards. It will take place as follows: Students in the boarding school are automatically enrolled in this game and form a team with their floormates (*Érasme 2, Rataud 3, Annexe 5, etc.*). The game can be integrated in the back-to-school events to gain legitimacy to the regards of the administration, for instance by building a partnership with student's associations as *Écocampus* or *le COF*. The rules are easy: the floors should have the lightest normal bin and the heaviest compost bin. The weight of the bins will be measured using the same system as the canteen one : integrated scales. To prevent cheating, the measurements should be taken in photo each time the bin is emptied, and the result sent by email to the *Compasteur Pôle*, in charge of the competition. The experiment is designed to avoid side-effects: the control with photographs avoids data-hacking; if a floor is tempted to throw away a part of its normal-bin (to reduce the effective

measure weight), they should nonetheless have the heaviest compost bin, making their cheating-effort less valuable. Normal bins weights could also be compared with mean values to ensure the absence of cheating; we eventually expect *normalien* to be smart and sensitized enough to not voluntarily increase food waste. In line with the theory that people tend to behave in accordance with the norm, one popular behavioral technique is informing individuals how their pro-environmental behaviors relate to that of the majority (OECD, 2017). In our case, this can be implemented in the form of emails sent out to residents at the end of each week over the contest, detailing how their floor performed in terms of composting compared to the average across floors (measurement of weights of the normal bin and the compost bin), as well as a ranking. Depending on the allocated means, gifts can be provided to the winning-floor, like a reusable cup for each student: this would increase active participation because of the presence of a tangible reward.

#### 4. Make it TIMELY

The composting intervention should be introduced in the beginning of fall semester 2023, when students are moving into the dorms. Changing accommodation, especially in the case of a student residence, leads to a radical change in routine, which makes the start of the school year the perfect time to introduce new rules and form new habits (United Nations Environment Programme and GRID-Arendal, 2020), as opposed to the middle of the year. Moreover, it makes sense for the social-game project: based on the idea that a sense of belonging to a team increases motivation (Pedler et al., 2020), the newcomers in dorms can meet and interact and thereby increase social link through the game and form a “team spirit”, an important parameter for their overall well-being. A mandatory resident reunion on environmental policies at the ENS should

be held at the same moment, where the subject of compost will be introduced. Additionally, a point on the composting program will be added to the «chartes de l'internat» (a document students sign upon moving in), which will act as a pre-commitment – technique proven efficient in Baca-Motes *et al.* (2013). Eventually, the *Compasteur Pôle* will launch online communication and present the project in the *courô* during the association's presentation (on the back-to-school period).

## **Deliverable**

### **Material**

1. A big compost tray for the Cour Pasteur. Different composting techniques exist, but our provider Moulinot, which already deals with waste at ENS, is able to conduct an audit to propose the best solution. According to our research, worm composting or heap composting are the best solutions. The provider also processes the revaluation of ENS waste. Estimated budget: 200€.
2. 30 green bins for composting in kitchens. Estimated budget: 300€.
3. A weighting system similar to the one in the canteen for our bins. Estimated budget: 600€.
4. Ground-material : with the help of the administrations, the ENS gardeners could store dead tree branches that will be mixed into the compost in Cour Pasteur. Estimated budget: 0€.
5. 60 Posters to arrange in the boarding-school kitchens and on campus to help people sort their waste and sensibelize them to composting. Estimated budget : 0€.

6. An etched wood panel to put in Cour Pasteur with the main information about the composting system. Estimated budget : 20€ (the etching can be done in the ENS fablab).

**Non-material:**

1. Time and labor: organizing the resident meeting on environment at the start of the year, installing bins and posters, weighing bins, sending out emails to students, compiling forms
2. Expertise and skills: Moulinot audit, bin weighing system, calculating statistics

Total budget : 1100€.

**Logistics**

The current intervention was submitted in response to a call for projects for an ENS workshop on sustainable schools<sup>1</sup>. A number of projects will be selected to receive funding and support from the administration.

Another possible source of funding for the project would be through a PSL financial aid program, as our project answers a sustainable development objective (UN, 2015). We expect strong assistance from our provider in audit, installation and waste valorisation<sup>2</sup>.

The authors of the current proposal will act as the student initiative group and will be charged with the waste management but support is expected from the provider and the ENS administration, and we believe that students' behavioral engagement makes the deal.

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<sup>1</sup> <https://transformation.ens.psl.eu/project/ecole-durable/collect/depot-des-idees>

<sup>2</sup> <https://www.moulinot.fr/collecte-et-valorisation-de-vos-biodechets/>

### Calendar of the intervention

| January 2023   | February 2023  | March - June 2023   | July - August 2023  |
|--|--|---|---|
| Submission of the project for the workshop on sustainable course.                | Discussion with the administration and the gardeners about logistics issues.<br><br>Installation of scales on the normal bins in kitchens. | Collecting data about monthly normal bins' weight.                              | Installation of compost bins and scales in kitchens and in-pile compost in Cour Pasteur with the help of our provider.<br><br>Formation of maintenance agents.<br><br>Preparation for the conference. |
| September 2023   | End of September 2023  | October 2023 - May 2024   | June - July 2024  |
| Back-to-school game and conference about compost.<br><br>Launch of social media. | Satisfaction questionnaire at the end of the game.   | Weight measurement (average on a month) of normal and compost bins in kitchens. | Satisfaction questionnaire at the end of the year.<br><br>Comparison of data with the previous half-year to study potential improvement in the process.   |

The intervention is designed to have a six-month preparation (in orange), where we are working in close relationship with the administration and are collecting data that will set-up a baseline for our future assessment. The core of the intervention (in blue) happens in September, with our game designed for three weeks to allow people to meet and compost together in their floor. At the same time, we hold a mandatory conference about ecological issues at the ENS, introducing

the composting activity on campus. Simultaneously, we launch our social campaign with regular posts to gain engagement, expand and reach more students. Throughout the year, we expect people to keep composting and we assess this behavior with numerical data and feedback insight. Once the intervention is set up, the first six months are not necessary anymore to reconduct the intervention since all the equipment is already installed and we have data from the previous year.

### **Assessment**

One of the goals of the project is to assess its efficiency. Because of ethical concerns and logistical difficulties, it would be impossible to compare our intervention with a control condition of not installing bins at all in certain parts of the dorm/installing them without implementing any additional measures/controlling for each measure separately. Therefore, the assessment will be carried out through comparing the mean monthly weight of non-recyclable waste bins (February-June 2023) with their weight after the intervention, with a control by the weight measurement of kitchen's composting, such that we expect:

$$\text{Weight}(\text{normal bin})_{\text{pre-intervention}} = \text{Weight}(\text{normal bin})_{\text{post-intervention}} + \text{Weight}(\text{compost bin})_{\text{post-intervention}}$$

$$\text{I.e : } \Delta \text{Weight}(\text{normal bin}) = \text{Weight}(\text{compost bin})$$

To assess the efficiency of the 3-week game intervention, we will design the end-of-the-game questionnaire to measure satisfaction on the following criteria: Length, Motivation to compost, Meeting new people, Enjoyment during the game. We will design the end-of-the-year questionnaire to measure satisfaction on the following criteria: Motivation to compost, Maintaining the habit to compost, Understanding of the composting system, Issues the students faced to compost.

Although we specified in the calendar specific time where we expect to have a discussion with the administration, a continuous dialogue is preferable to face together all the logistical issues that we might encounter (for instance if the students are not throwing the content of compost bins in kitchen in the main compost trail in *Cour Pasteur*) or for any technical issue regarding composting activity.

## **Limitations**

The main limitation of the assessment of the project is the impossibility of using a control group and administering a pre-test and a post-test to measure the impact of the intervention in changing the students' patterns of pro-environmental behavior. If the intervention proves itself successful in the 1st year, improvements can be made during the 2nd year, and then it would become possible the questionnaire and bin weight data from 2023-2024 to 2024-2025. Another important point is that the measurement system of bin weight needs a lot of development and perfecting. In the future, we could try and establish a system of measuring contamination between the normal and compost bins, following the example in Szczucinski et al. (2020), but that would be highly costly in terms of effort and expertise required. Lastly, the intervention is not free of material cost. However, once the system is in place and functioning, no other expenses will be required.



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