

1. Problem

The impact of digital pollution

In the context of global digital transition, the relationship between digital and the environment is a crucial issue for the future of the planet. For some, the opportunities of digital technology are a godsend, making it possible to manage the necessary ecological transition better¹. For others, with studies to back them up, the current use of digital technology is polluting enormously and exerting consequent pressure on the planet's resources². In this context, where ecological and digital transitions must go hand in hand, the first significant obstacle is the deficient awareness of digital pollution. Simultaneously, a CNRS researcher, Françoise Berthoud, observes that *"estimates of ICT (information and communication technology) electricity consumption (...) are around 10% of total global consumption today. This 10% is approximately 30% for data centres, 30% for user terminal equipment and 40% for telecommunications networks. (...) Greenhouse gas (GHG) emissions related to ICTs (...) now represent between 2 and 5% of all GHGs emitted on the planet, more than all civil aviation"*³. Moreover, this balance does not take into account energy consumption and other environmental impacts resulting from the production of digital devices, such as mining extraction, the distribution of these devices, or their destruction after use, which are great contributors to pollution.

The lack of awareness

If we consider the Internet as a country, this country would be the 7th largest emitter of greenhouse gases in the world⁴. In the meantime, when talking about environmental actions to take, few individuals mention digital pollution. Indeed, online activities seem dematerialized and virtuous by nature. As regular people don't see data centers and telecommunication networks, it is rather challenging to make them aware of their massive impact on the environment.

Emails storage contributes to digital pollution

As we mentioned, data centers pollute a lot because they are very energy-intensive. Thus, each digital activity on the Internet - which requires a data transfer to the data centers - leads to energy consumption (for the operation of their servers) and water consumption (for cooling them by air conditioning). If we take, for instance, the digital activity of sending and storing emails on mailboxes, studies show that « sending a 1-megabyte email is equivalent to using a 60-watt bulb for 25 minutes, the equivalent of 20 grams of CO₂ emitted »⁵. The more the email has color, weighty designs, attached files,

¹ Geoffron, July 2017, « **How are the digital and environmental transitions interconnected ?** », Responsabilité & Environnement, Paris N° 87, pp. 17-19., <https://search.proquest.com/docview/1915305430?pq-origsite=summon>
Demailly, Francou, Kaplan, Saujot, July 2017, « **How to make the digital and environmental transitions converge ?** », Responsabilité & Environnement, Paris N° 87, pp. 13-16. <https://search.proquest.com/docview/1915306143?pq-origsite=summon>

² Karen Hao, June 2019, « **Training a single AI model can emit as much carbon as five cars in their lifetimes** », MIT technology Review, <https://www.technologyreview.com/s/613630/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/>

³ Translated from French. Berthoud, July 2017, « **Digital technology and the environment** », Responsabilité & Environnement, Paris N° 87, pp. 72-75. <https://search.proquest.com/docview/1915308591?pq-origsite=summon>

⁴ Novethic, may 2019, « **Si internet était un pays, ce serait le sixième consommateur d'énergie et le septième émetteur de CO₂** », <https://www.novethic.fr/actualite/infographies/isr-rse/envoyer-un-mail-regarder-une-video-l-impact-environnemental-du-numerique-decode-145813.html>

⁵ Quote from Françoise Berthoud, translated from french. Cailloce Laurence, May 2018, « **Numérique : le grand gâchis énergétique** », CNRS Le Journal, <https://lejournel.cnrs.fr/articles/numerique-le-grand-gachis-energetique>

the more they will generate digital pollution. For a year, one regular email stored in the mailbox, will generate 10g of CO₂⁶ and 19g if this email contains one attached file.

By focusing on emailing practices, the challenge is therefore to inform the Internet user of the impact of these virtual activities. Indeed, we believe that the best way to reduce the ecological footprint of digital technology is to find a tool to educate the user into less polluting online activities. In addition, it is a question of giving them the necessary incentive to act more sustainably. In a nutshell, our initial question is : **how to reduce email storage, which contributes to digital pollution, knowing that lack of awareness leads to a lack of actions towards the issue?**

2. Proposed concept

How we came up with the tool

We aim to target digital pollution through email consumption, because it is a very polluting digital domain, both simple to define and easy to make more virtuous. The effects of our solution will thus be rapid, significant and far-reaching, because by a numbering effect individual efforts will have a significant impact on a global scale. Also, this issue is particularly important because it is something we can act on, daily. We believe in the great feasibility of our project because some tools have already been developed to make people aware of their carbon footprint on the Internet and to reduce it. This is the example of *The Shift Project* and their « decarbonalyser » tool, which quantifies the carbon footprint of each online activity from *Firefox* in direct time⁷. There is also *Plana*, an app developed by *Digital for the planet*, analyzing the user behavior on their smartphone and suggesting actions to reduce their digital pollution. In the same way, we wanted to find a tool that could be integrated directly into mailboxes in order to really help the user to deal with their email consumption and reduce their pollution.

Our tool, YourStorageImp@ct

Our project consists in creating a progress bar, which would be placed on the top of email pages or applications and giving necessary information about the carbon footprint that each user generates through their email storage. The color of the bar would evolve from green (great efforts to make emailing practices more virtuous) to red (lack of regular effort). It would also indicate the weight of CO₂ per year the user consumes with their actual storage. Finally, a 'question mark' button would give the user an overview of their footprint statistics, some advice to reduce their pollution, and more information on digital pollution.

With more details, here is how the three parts work :

First of all, we fixed a threshold to 8 kg CO₂/year for filling completely the bar. It represents approximately 500 emails stored in the mailbox. The tool can measure and analyze what the user receives. When the user gets an equivalent of 8 kg CO₂/year of unprocessed emails (neither archived nor deleted), the bar is filled completely.

- The progress bar is here to encourage the user to deal with their emails. It would move towards the green when they delete or archived their emails (archiving an email means that they tick a box and save it). When the user only have archived emails the bar is empty.

⁶ June 2019, « *Digital pollution : emails and carbone emissions* », Cleanfox, <https://cleanfox.io/blog/digital-pollution-en/digital-pollution-emails-and-carbon-emissions/>

⁷ Geist Jean-Noël, July 2019, « *Climat : l'insoutenable usage de la vidéo en ligne : le nouveau rapport du shift projet sur l'impact environnemental du numérique* », The Shift Project, <https://theshiftproject.org/article/climat-insoutenable-usage-video/>

- The CO2 indicator is here for the user to know the amount of CO2 resulting from their storage, giving them the incentive to delete their emails, even the archived ones that still pollute
- The question mark button will provide the user with the necessary information. It will explain what is this bar for and provide the user with some statistics, such as the number of archived and unprocessed emails, the number of emails archived without being consulted for more than 6 months ... and the equivalent weight of CO2 they represent. This button will also allow the user to learn more about the benefits of decreasing digital pollution and how to do it on an individual basis, with access to the following link :

<https://cleanfox.io/blog/digital-pollution-en/digital-pollution-emails-and-carbon-emissions/>

Finally, our tool would give specific badges to the user to increase visibility and expected positive of the tool. For instance, a green badge would appear next to the bar when it is filled lower than a quarter. When the user deletes more than 30 emails at the same time, a firework would appear for 5 seconds on the bar. Finally, when the user reaches three quarters of the bar, a warning sign would appear next to the bar and would flash every time the user opens their mailbox.

We designed this tool to give incentive to mailboxes users to have a responsible email consumption. We expect it to be complete and clear enough. It will be effective because it gives the users a visual representation of their CO2 saving and they will want to make the bar decrease. When testing other tools, such as the *Plana* one, we realized that people need to actually see the impact their actions have on the environment in order to act on it.

3. Expected positive impacts

A positive impact on reducing pollution

On the long term, our tool would have one significant positive impact on the environment. The objective is to give incentives for people to delete their emails and to reduce and lighten their email consumption. With our tool, people would progressively be used to clean their mailbox, check the weight of the emails they send, and to prefer other forms of communication or storage over emails. Furthermore, people would be more aware of the contribution of email storage and exchanges to pollution and about what is digital pollution in general. If digital pollution becomes a 'top of mind' problem in the daily life, we would expect more actions, from individuals or companies, to act against digital pollution, or at least, to not take decisions that would increase it. At a company level, pollution can be immense, but decisions are taken by individuals and are influenced by their way of thinking, their personality, and their values. The more individuals are environmentally conscious, the more we can expect them to build and run sustainable companies. These positive impacts would last in the long term. Even if we hope for a higher wake-up call at the beginning, we may, in the long run, create a habit for individuals, something they do without thinking about it.

A positive impact for email companies using YourStorageImp@ct

Reducing digital pollution is, of course, the goal we aim to reach. However, one other positive impact would be for the email companies who would agree to integrate the YourStorageImp@ct bar to their mailbox page. Big tech companies are regularly accused of making the environmental situation worse because they value innovation and profit more than anything else and not in a greenway. In addition, those companies own a huge part of global wealth and are seen as the ones that should invest to save the planet. It's essential for companies such as Google to show that they care about the environment and that they take concrete actions towards a reduction of pollution. Promoting and

integrating our tool would help them to shape their image of an environmentally conscious company that doesn't only care about money.

4. Major risks and actions to reduce them

Creating pollution in the development phase of the tool

One serious problem which occurs when developing any tool to reduce pollution is making sure that creating the tool is not making pollution worse. Of course, developing YourStorageImp@ct will create digital pollution, even though we will try to keep it as low as possible. In any case, we expect benefits from the tool much higher than costs regarding digital pollution.

Acceptance of the tool by the users

Since people can't remove the storage bar from their mailboxes, some people may dislike it, find it disturbing or stressful, or simply dislike the design of it. The tool is here to be seen, so it can give incentives for people to act, if some individuals don't like it, it may indeed be an issue. That is why the animated effects of the tool would stop after some time, to not irritate unnecessarily the user. The question mark button with the informative text box, integrated next to the bar, is also a way to inform users about why our tool is essential. Also, after discussion with the email companies, we may decide to make the first version of the tool optional, to analyze how users receive it and if it is reasonable to make it mandatory. We could also try to test the tool beforehand to avoid major risks. we could develop a first version of the tool, not linked to the mailbox, but that people would have to download on their computer as a widget for a testing period. Another solution is to integrate the tool on one or several companies or school mailboxes. For instance, Gmail Sciences Po is a specific mailbox for Sciences Po students and teachers, run by Google.

The tool as a threat for some companies

It is important to keep in mind that some companies could be negatively impacted by our tool. Some businesses use a lot of emails to promote their services or products. Yet, our tool could dissuade people from registering to newsletters or encourage them to delete spams right after receiving them, without paying much attention to their content. In the long term, we want to get the approval of all companies and encourage them to change their promotion or communication models. In parallel with the development of the tool, we want to communicate with companies to explain our project, get their approval and help them to adapt their communication model to contribute to the reduction of digital pollution.

5. Deployment strategy and major milestones

Our tool is a B2B model, we are not trying to sell anything to the mailboxes users but to the email companies. **The steps to consider in the development are the following:**

- The first one is to code the metrics, not on the base of the average environmental impact of an email, but taking into account the weight of each email received on the total storage. The coding of the algorithm is the longest step, the more complicated and the more important.
- The second step is then to design the toolbar itself, finding a good graphic equilibrium to make it visible on the screen but not too invasive for the user at the same time. It is important in this part of the development to wisely choose the gaps in storage that have an impact on the

toolbar. Then we have to design the 'question mark' section and complete it with informative content.

- Then, a work of lobbying and marketing has to be conducted to contact and convince our main partners, who are the major email platforms like Google, Free and Outlook.
- Once a partnership is found and the platform accepts to use the tool, it is fundamental to assure the development of the project in collaboration with the platforms, and to share the development costs with them.
- Then, the last step is to build a program of marketing with the platforms, to come up with a campaign explaining the users why a new tool appears on their mailbox, what is digital pollution, and how they can help

6. ROI analysis

The coding and design are the main initial costs. As the tool is quite simple, the first investment can be estimated at a basic software price: around 20 000€. It considers the design and the coding of the toolbar, and the information around it. It also takes into consideration the legal costs of the protection of intellectual property. This first investment will be financed by NGO and Government subsidies found during the first campaign of marketing done by volunteers and environmental activists. The second step is to fund the second campaign of marketing, estimated to 30 000€, to find conventions and sign partnerships with platforms. The platforms companies do not buy our tool, however, they sign a convention with us, engaging to pay for the maintenance costs of the tool, and giving financial participation to have the right to use the tool. Law and administrative costs also must be taken into consideration to sign the conventions, around 10 000€. The first goal is to sign at least one convention with one of the top 5 platforms, the financial participation of a platform is fixed to 40 000€, to find an equilibrium with all the costs of the second step. To ensure the financing of the project, a short-run loan of 40 000€ is contracted before this marketing campaign. The third step consists of a third marketing campaign, estimated to 30 000€ by the platform. This time, the scale is larger, and the targets are the companies that can use our tool to improve their public image. The marketing costs are paid by the platforms. When a company decides to use the tool in its internal mailing systems, it has to pay a participation of 2000€, half of it going to the platform and half to us. With the cash flows coming from the platforms participation, and from the companies that decide to be partners, it will be possible to finance new digital tools to reduce digital production, and/or depending on the results to promote a growth strategy of the first tool developed.

7. Organization

Our main targeted partners are the big email companies, especially Google, Outlook, Free, and AOL, because they are the only actors that can give our tool the scale of action that can have a real environmental impact. Our main allies will be the non-governmental organizations, environmental activists, and public personalities that will have the key role in finding the first investment input to launch the project. The main organizational principle is a non-exclusive partnership. It has the benefit of finding funds and relays to develop the tool, without limiting it to a platform. Therefore, its simplicity and quite low costs for very big companies do that it can be implemented on all the main email platforms, and be adopted by thousands of companies through the marketing campaign done by the platforms.