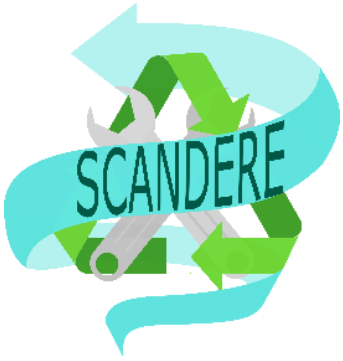
Scandere EU PaaS Deliverable 2.1, Assessment of EU Regulations by Compliance & Risks



This report was drafted by Dr. Aaron Green for Compliance & Risks.

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Scandere EUPaaS - D2.1, Part 1 - Industry Survey: the state of play for PaaS

Objective:

There were two goals for this survey. The first was to establish an overview of PaaS systems currently being employed by industry. The second was to understand how these systems are helped and hindered by the existing regulatory environment.

Methodology:

Our methodology was to conduct interviews with who currently work with PaaS systems as well as sustainability managers who are familiar with the circular economy goals at their company. The standard questionaire for the interviews is provided in the Annex. This survey was qualitative, not quantitative, and the survey size was much too small for any statistical analysis. Compliance and Risks specifically targeted 223 companies. We also cast a wide net to our existing clients and our full prospect database that includes over 5000 companies through general marketing materials as well as an advertisement for the initiative on our landing page. Our business development department committed three lead generation specialists to make contacts for this project, and 2 members of our marketing team also helped with advertising and work to raise awareness. In our industry survey, we found the same divergence between sustainability statements and sustainability actions that we found in the regulatory policies. Industry has only taken an interest in more sustainable business models where they are also more profitable than existing business models.

Obstacles:

Our plan was to conduct a few dozen interviews and take a representative sample of 10 interviews to highlight the state of PaaS in the market. In 9 months, we were only able to find 8 companies that were willing to speak with us, and only 2 of these had a consumer-level PaaS offering. From the interviews we conducted, it became clear that most companies were waiting to see whether a PaaS model could be profitable before committing resources to large-scale consumer-level programs. A few points stand out in this regard.

- PaaS models have been implemented in B2B settings for high-cost, limited-use equipment such as construction equipment and medical diagnostic equipment. This

implementation is purely for financial reasons with little or no sustainability function, since these high-value products are unlikely to be discarded as waste.
- PaaS for B2C markets have greater potential impact on sustainability, but they experience more barriers to deployment and profitability than B2B markets.
- Uncertainty is the dominant factor. None of the respondents had a clear picture of the regulatory framework applicable to PaaS models with regard to finance, product safety, labelling or advertising.

Respondent 1

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No.

Do ecodesign regulation requirements make PaaS more viable?

- Yes. Extending the lifespan of standard products without refurbishment reduces servicing costs.

In the strictly B2C realm of consumer products, we had only one respondent, which was a small pilot-project company with 20 employees set up by a larger manufacturer. Due to its small size, this company had no compliance officer and was still dependent on the larger company for compliance and legal support. One challenge encountered by this company was accurately representing the products on offer. This problem arose because a large number of different models were available as older models could be offered alongside newer models. The number of different models covered by the same offering made it difficult to accurately represent the offering in marketing materials. Moreover, for the sustainability objectives of PaaS to be met, older and repaired products must be made available for future customers. The refurbished product may have a different energy consumption and water use profile, which would not be represented on its existing label. The respondent expressed frustration at the fact that the energy efficiency label for a PaaS model does not benefit from the energy savings that come from avoiding the production of a new product.

Respondent 1 also indicated that the PaaS project was more aspirational than profitable, but that regulations mandating component harvesting and raw materials shortages could provide greater incentives for industry to consider PaaS more broadly. Interestingly, the respondent indicated that the WEEE Directive product takeback requirements provided no incentives relevant to PaaS, which would seem to be an indictment of the WEEE framework as a driver of sustainability. This suggests that the WEEE takeback framework is an alternative funding mechanism for traditional disposal practices rather than a sustainability policy.

Finally, respondent 1 related anecdotally that their PaaS offering faced opposition from the consumer credit industry, both in anti-PaaS marketing campaigns and in government lobbying

efforts to restrict PaaS. He noted that the manufacturing industry's own lobbying was mute with regard to the conflict between PaaS and consumer credit.

Respondent 2

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No.

Do ecodesign regulation requirements make PaaS more viable?

- No.

Respondent 2 was a major electronic products manufacturer with a dedicated sustainability program actively seeking appropriate product lines for circular economy and specifically PaaS offerings. Their first PaaS offering, which was being prepared for launch at the time, was a professional level recording instrument. The offering was very similar to a traditional car lease where the basic term was a three year lease with the option to cancel. The primary challenge noted by this respondent was finding a financial institution willing to provide financing backing for the credit agreement underpinning the lease. Most banks were not willing to issue a credit agreement for a product worth less than £5,000, and many banks had a lower limit between £10,000 and £20,000. The respondent eventually found a financial institution willing to offer a lower limit of £3,000, which would only be viable for high-end professional equipment.

This experience raised an important, open question for PaaS more generally, which was how financial accounting principles should be applied to PaaS? Respondent 2 indicated that consumer credit requirements did not affect them because they were treating PaaS as an operational lease rather than a finance lease. This distinction raises complex questions of revenue realisation and distribution of risk that could not be answered by either respondent 1 or 2. These issues are not easily resolved by reference to the consumer finance regulations as they involve trade-offs between asset valuation, income realisation, insurance and risk management. However, it is important to consider these complicating factors when we consider the viability of PaaS systems.

Two challenges for scalable PaaS were raised by respondent 2. First, the company was not trying to become broadly sustainable, only to apply sustainability where it was already commercially viable. Second, PaaS was found to be commercially viable where demand for the product was below the price point for manufacturing, so that PaaS allowed for a match between supply and demand where both were very low. This mirrors our findings for B2B PaaS offerings, where certain types of medical diagnostic and construction equipment are too expensive to justify purchase given the short-term nature of their use.

Respondent 3

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No.

Do ecodesign regulation requirements make PaaS more viable?

- Not applicable

Our third respondent was a medical diagnostic equipment manufacturer who used PaaS to support the medical trials where the useful life of the product was substantially longer than the duration of the clinical trial. Clinical trials might last only a few months, while diagnostic equipment PaaS was an obvious solution for this situation, regardless of whether it was more sustainable. This was a small company in the global market, so the primary challenge for their PaaS offering was the complex and differing regulations in different countries as well as regions within countries. In particular, this respondent indicated that Argentina, Israel, South Korea, and China posed difficulties for shipping test equipment due to complex customs procedures. In Italy, they found that infection control measures were often implemented at the local level, which substantially increased the regulatory compliance and data management requirements.

Respondent 4

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No

Do ecodesign regulation requirements make PaaS more viable?

- Not applicable

Our fourth respondent was a construction equipment manufacturer whose customers often used product leasing to supplement their fleet with additional or special equipment that would not be needed on a consistent basis. The demand for PaaS was driven by

- Flexible fleet management for companies to take on larger jobs than their existing fleet would allow.
- Continuous operation when time pressure demands that disabled equipment be repaired or replaced immediately.

This respondent was particularly aware of high-level circular economy directives that lack clear implementing instructions. Information problem with no map of the path from linear to circular model. As a manufacturer of potentially dangerous products, the respondent was also aware of the conflict between circularity and regulations regarding product safety, quality and materials. Batteries in particular raised questions about reuseability with regard to safety and damage liability and the tests that would be required for adequate reassurances. This respondent noted that companies commit to quality and safety rather than circularity in part because quality and safety have well-defined risks and compliance mechanisms, whereas circular economy is based on aspirational goals.

Both of our B2B respondents had long-term experience with PaaS. At both companies, the motivation for their use of PaaS systems was the production of high cost, low-demand or highly specialised products where the market for sales could not support the production of the products.

Respondent 5

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No.

Do ecodesign regulation requirements make PaaS more viable?

- Not applicable

Our fifth respondent did not have experience with PaaS systems, but was interested in circular economy for different reasons. The fifth respondent was an electronic component manufacturer in the process of building out their sustainability program and researching alternative distribution models.

Respondent 6

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No.

Do ecodesign regulation requirements make PaaS more viable?

- Not applicable

The sixth respondent was a bicycle design startup firm that was interested in PaaS but lacked the budget necessary to support an alternative sales model. This respondent experienced many of the regulatory barriers standing in the way of PaaS systems in general, such as the need to re-certify older models when new regulations were introduced and re-labelling inventory in response to changes in labelling requirements.

Respondent 7

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No.

Do ecodesign regulation requirements make PaaS more viable?

- No

Respondent 7 was a sustainability manager for a major electronics manufacturer, and while this respondent was not personally engaged in delivering PaaS offerings, they had over a decade of experience working with PaaS business models. They found that PaaS systems were driven by

business opportunities to find new customers and provide consistent revenue. They did not find that PaaS provided consistent benefits for sustainability or circular economy. PaaS systems did not have any relevance with regard to compliance with existing regulations, but they were monitoring upcoming regulations to determine whether PaaS might have some relevance in the future. There was no connection between PaaS and material savings, and this respondent found that the additional cost of managing PaaS business models generally outweigh any potential savings in terms of raw materials. This might change if critical raw materials become less available, but there are no present supply chain bottlenecks that would necessitate material reuse on a large scale.

This respondent suggested three regulatory changes to make PaaS offerings more viable:

- Waste shipment regulations need clear exemptions for parts to be refurbished/remanufactured. There are exemptions, but the language is confusing and easily misinterpreted by industry and regulatory bodies.
- Allowances for refurbished products to be placed on the market without additional testing. "Repair as produced" requirements are a hindrance.
- The draft Ecodesign Regulation proposes to establish requirements for specific product groups, one group at a time. For a circular economy model, it will be necessary for regulations to cover all products generally.

Consumer finance regulations were found to be a hindrance, but not the main barrier to PaaS delivery for consumers. They had not experienced significant problems with labelling requirements. The management of lease agreements and contract records also added costs and complexity to the PaaS offering, but it was not clear whether this would be prohibitive over time.

Respondent 8

Does PaaS mitigate supply chain bottlenecks or raw materials shortages?

- No.

Do ecodesign regulation requirements make PaaS more viable?

- Not applicable

Respondent 8 was a compliance officer with a specialised sensor manufacturer who had some experience with PaaS subscription offerings for low-volume, high-priced products for commercial use. They noted that 90% of the PaaS deliveries were ultimately purchased by the client. For this respondent, regulatory compliance was not connected to PaaS offerings, although the company was monitoring proposed regulations on circular economy in relation to PaaS. The compliance process for the PaaS system was identical to products sold with regard to electronic waste and packaging. There was no account of materials saved by the PaaS system or connection between PaaS and supply chain budget.

With regard to recommending regulatory changes to support PaaS, this respondent suggested that the econdesign requirements and packaging requirements could help to promote more durable products with better materials, but small companies may not the capital required to access more durable materials. Sustainability legislation provided a basis for this respondent to argue for more sustainable product development to management, but this argument was motivated by an interest in sustainability, not by the regulatory requirements.

Appendix - Survey Questionnaire

If your company has experience with Product as a Service (PaaS) or lease models for distribution:

1. Is the budget for PaaS connected to the budget for regulatory compliance with extended producer responsibility or ecodesign requirements?
2. Is there a system for accounting for the materials savings provided by PaaS?
3. Does PaaS mitigate supply chain bottlenecks or raw materials shortages?
4. Is PaaS budget connected to the supply chain budget?
5. Do ecodesign regulation requirements make PaaS more viable?
6. Would you recommend a regulatory requirement that would make PaaS more commercially practical?
7. Is PaaS hindered by consumer finance regulations?
8. Is PaaS hindered by energy efficiency or environmental labelling regulations (requiring standard model information)?
9. Does the complexity of managing lease agreements hinder PaaS?

If your company does have a PaaS system, would the issues involved in the preceding questions make the PaaS model more or less attractive for your company?

Respondent Role	Company size	Product type
1 Director	10 < employees < 100	Consumer appliances
2 Global Sustainability Manager	100,000 < employees	Consumer electronics
3 Regulatory compliance officer	100 < employees < 1,000	Medical equipment
4 Global Regulatory Compliance Manager	10,000 < employees <100,000	Construction equipment
5 Global Compliance Officer	100,000 < employees	Consumer electronics
6 Global Compliance Manager	10 < employees < 100	Bicycles
7 Sustainability Director	100,000 < employees	Consumer electronics
8 Regulatory Compliance Manager	100 < employees < 1,000	Specialist electronics

Scandere EUPaaS - D2.1, Part 2 - Survey of EU Regulations

Deliverable 2.1, Part 2

Objectives

The goal of this regulatory review is to show hindrances and supports in regulations in the EU member states regarding the concrete PaaS example offerings on the market.

Methodology

We conducted a survey of European regulations that are potentially relevant to PaaS offerings using C2P, which is a global database of regulations structured to provide access to relevant requirements for specific product categories and regulatory areas. The survey considered regulations covering household appliances in the areas of product safety, chemical restrictions, extended producer responsibility, packaging, energy efficiency and consumer protection and circular economy. Compliance & Risks has been monitoring regulatory developments related to sustainability for 20+ years, with a client base of over 250 companies who both use and validate the data provided in C2P. This gives us high confidence that we are considering the relevant data set.

Findings

Consistent with our industry survey, we found that the regulatory requirements for products are disconnected from PaaS models. This offers insight into the more general failure of regulations with regard to climate change and sustainability in general, where it is becoming increasingly clear that existing and proposed regulations will impact individuals locally but have little or no impact on a global scale. Our survey of regulations reveals that they mirror the problem of sustainable engineering. Namely, our regulatory methodology applies to acute harms caused by individual products and actions, but fails with regard to chronic, diffuse, environmental harms with many independent and unidentified causes.

The regulatory barriers to the Product as a Service (PaaS) model emerge largely as unintended consequences of regulations intended to serve other purposes. The broad reach of laws that protect consumers rights and corporate profitability tend to promote linear sales models and

product disposability[1]. For example, consumer protections that were enacted to prevent predatory lending may also prevent the effective deployment of PaaS systems, as in the case of the Netherlands a lease cannot run longer than 75% of the product's expected lifetime before convering into a sale[2].

Our survey of European law and policy reveals a ground-level indifference to circular business models despite the high-level enthusiasm for a circular economy. Regulations make no distinction between linear sales, leases, and products provided as a service, because the act of "placing on the market" triggers the applicability of product-related regulations in the EU common market irrespective of the business model, and no provisions have been made for more circular business models. In 2018, the EU Commission issued an amendment to the Waste Directive requiring member states to "promote and support sustainable production and consumption models" and "(b) encourage the design, manufacturing and use of products that are resource-efficient, durable (including in terms of life span and absence of planned obsolescence), reparable, re-usable and upgradable"[3] . Although this suggests that regulators are aware of the need for novel regulatory interventions, the EU Commission has not provided guidance on how to promote sustainable production and consumption models through regulations. In the absence of clear guidelines, none of the EU member states has thus far implemented a regulatory provision to promote sustainable production and consumption models as directed. For example, the Danish implementation adds a "self-monitoring" requirement, but no provisions for new consumption models.[4] This pattern holds across all member states.

Our survey indicates that the existing regulatory environment is too splintered to provide a clear path towards a circular economic model like PaaS. According to Dahlhammar et al., "current tax schemes, regulations, supply chains and consumer habits are all geared into linearity, and thus new types of solutions face a multitude of institutional barriers."[5] In our survey of EU regulations, listed in the Annex, covering ecodesign, e-waste, batteries, packaging, product safety, consumer protection and finance, we found that no regulation distinguishes between circular consumption models and linear sales.

[1] Dalhammar, C., Wihlborg, E., Milios, L., Richter, J. L., Svensson-Höglund, S., Russell, J., & Thidell, Å. (2021). Enabling reuse in extended producer responsibility schemes for White Goods: Legal and organisational conditions for connecting resource flows and actors. *Circular Economy and Sustainability*, *1*(2), 671–695. https://doi.org/10.1007/s43615-021-00053-w
[2] Sakao, T., Wasserbaur, R., & Mathieux, F. (2019a). A methodological approach for manufacturers to enhance value-in-use of service-based offerings considering three dimensions of sustainability. *CIRP Annals*, *68*(1), 33–36. https://doi.org/10.1016/j.cirp.2019.04.084
[3] Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste
[4] Denmark ACT no. 807 of 09/06/2020. https://www.retsinformation.dk/eli/lta/2020/807
[5] (p. 672), Dalhammar, C., Wihlborg, E., Milios, L., Richter, J. L., Svensson-Höglund, S., Russell, J., & Thidell, Å. (2021). Enabling reuse in extended producer responsibility schemes for White Goods: Legal and organisational conditions for connecting resource flows and actors. *Circular Economy and Sustainability*, *1*(2), 671–695. https://doi.org/10.1007/s43615-021-00053-w

Discussion

The EU Guidelines for regulatory design acknowledge that regulatory intervention start with indentification:

> The starting point for an evaluation is to consider how the intervention was expected to work. This requires identification of the different steps and actors involved in the intervention which in turn allows identification of the expected cause and effect relationships.[6]

This evaluation framework suggests that only linear models covering well-defined actors can be used for regulation. This implies that non-linear processes like PaaS, circular economy and sustainability in general cannot be regulated, which might explain the failure of existing sustainability policies to produce sustainable societies. The most important barrier to PaaS is that our cultural understanding of law and policy is fixated on linear models. Our findings suggest that PaaS, and sustainability in general, has not been thwarted by a failure of intent, but a failure of imagination. What makes industrial practices unsustainable is the accumulation of chronic damage, not any given set of causes or effects. Regulations based on well-defined cause and effect simply displace the harm to other locations or other industries.

One common practice among regulators is to apply existing regulatory frameworks to new areas where there is a demand for regulation[7]. For example, restrictions on chemical in products are taken from laws developed for the safety of food and drugs. In the case of chemical restrictions, there is no evidence that the ban on bisphenol-A resulted in public health benefits. Rather, chemical safety initiatives have shifted to PFAS, which are now subject to restrictions whose health benefits are equally unlikely to be validated. Microplastics are now in the air, water, soil and food and there is simply no realistic way to stop them or identify which parts of their chemical cocktail are likely to have an impact on human health or the environment. Even the RoHS chemical restrictions resulted in chemical substitutions that may be just as harmful as the restricted heavy metals. As Michael Kirchner notes

> [RoHS] restricted lead (Pb) in solder. The Directive did not tell the electronics industry what to replace it with, so we replaced tin/lead (SnPb) solder with a tin/silver/copper (SAC, from “Sn/Ag/Cu”) alloy. SAC was selected because it worked, even though it wasn’t a drop-in replacement. While lead is toxic, so are silver and copper (in different ways than lead). SAC alloy also melts at a significantly higher temperature so it increases energy consumption during production. Ultimately the total environmental

[6] EU Commission (2021). *Staff Working Document, Better Regulation Guidelines.* Retrieved from https://commission.europa.eu/system/files/2021-11/swd2021_305_en.pdf

[7] Brown, E. G. (2020). Time to pull the plug? empowering consumers to make end-of-life decisions for electronic devices through eco-labels and right to repair. *University of Illinois Journal of Law, Technology & Policy*, 2020(1), 227-252.

> impact of SAC is similar to that of SnPb (see chart below, original slide 31 here). https://www.eetimes.com/why-the-electronics-industry-is-being-regulated/#

Moreover, global lead emissions and concentrations have continued to increase due to increases in lead-related activities in the industrializing countries of the world.[8] We simply do not know what we are doing.

Perhaps more importantly, what we know how to do is not sustainable. Our engineers are trained to isolate systems and maximise outputs from those isolated systems, not to coordinate production, consumption and waste into an integrated, sustainable system. Our regulators are trained to restrict acute harms from existing industrial practices, not provide the infrastructure for alternative ways of life. This point was driven home by former US presidential chief-of-staff John Sununu, who almost single handedly scuttled US climate policy in 1989, calling the existing science "technical poppycock" that could not justify action. Thirty years later, when the science of climate change was fully validated, Sununu denied responsibility for the US government's inaction, claiming that a meaningful climate treaty was never a real possibility:

> "frankly, the leaders in the world at that time were at a stage where they were all looking at how to seem like they were supporting the policy without having to make hard commitments that would cost their nations serious resources. Frankly, that's about where we are today."[9]

As another example, energy efficiency labels have been in use for over a quarter century. In that time, global carbon emissions and energy consumption continue to climb and the climate continues to warm. Regulators have touted the energy savings enabled by energy performance testing, certification and labelling, but enabling success is different from actually succeeding, and none of our energy labels have led to sustainable consumption of goods or energy.

This is the paradox of sustainability in a nutshell. Writing in the German circular economy journal Mull und Abfall, Prof. Dr.-Ing. Christina Dornack suggests that numerous strategies for a circular economy are already available, but the political will to assert oneself has been lacking.[10]This notion of a lack of political will appears over and over again in scientifically-minded literature on sustainability without any indication of what "political will" means. It has become a kind of nervous tick, simultaneously assuring the reader that the author is aware of the political impediments to action while absolving the author of any responsibility for a political solution, which is really not at all within the ambit of scientific research. We scientifically minded folk just do the science and leave the politics up to politicians. Politicians do not lack political

[8] Streets, D. G., Horowitz, H. M., Lu, Z., Levin, L., Thackray, C. P., & Sunderland, E. M. (2019). Global and regional trends in mercury emissions and concentrations, 2010–2015. *Atmospheric Environment (1994), 201*, 417-427. https://doi.org/10.1016/j.atmosenv.2018.12.031
[9] Rich, N. (2018, August 1). *Losing earth: The decade we almost stopped climate change*. The New York Times. https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html
[10] https://muellundabfall.de/.download/170408/mua_20230801.pdf

will. The problem is that the will of politicians is what Hitler described as the "will to power" and politicians are absolutely full of it. The irony is, of course, that the laws of thermodynamics prohibit power from being sustainable, no matter how badly we would like to make it so. The nervous tick of "political will" allows scientists to avoid broaching the subject of entropy, communication and effective regulation. Caught between the will to power and the impending doom of environmental collapse, political strategists have borrowed the toolkit of auditing and reporting from financial regulations. Nevermind that financial reporting and auditing requirements have consistently failed to produce a sustainable financial system, audits and reports provide an impenetrable wall of data that deflects responsibility for failure and allows politicians to eat their cake and have it too.

Scandere EUPaaS - D2.1, Part 3 - Regulatory Recommendations

Aaron Green, Compliance & Risks

Background

This report is the third part of our series of reports on the relationship between PaaS and the regulatory framework for sustainable business practices. It follows on from our two previous reports: a survey of product manufacturers engaged or interested in PaaS and our survey of regulations related to PaaS. The goal of these reports is to investigate the regulatory barriers and benefits to PaaS.

Objectives

The original goal of this report is to provide recommendations or guidance for policy makers regarding regulatory changes to remove barriers or provide incentives for a broader implementation of PaaS. However, the lack of clear relationships between existing regulations and real PaaS programs necessitates a recalibration of the objectives. Before making recommendations, we need to understand why none of the numerous regulations whose stated goals are circular economy have any relationship to a practical application of circular economy principles.

Methodology

The planned methodology was a straightforward assessment of the regulatory requirements that hinder PaaS, the regulatory requirements that promote PaaS, and the regulatory changes that would be required to expand the viability of PaaS as a circular economy solution. However, because our surveys of industry and policy found a fundamental gap between policy and practice, the use of a comparative assessment would depend on pure speculation. Rather than speculate regarding what regulations might be doing or what regulations might work, this report is an investigation of the policy-making methods that have led to the present state of dysfunction.

Discussion

Our survey of PaaS providers and potentially relevant regulations produces two points of departure for regulatory recommendations.

1. Existing PaaS programs are too small to contribute meaningfully to the circularity of the businesses in which they operate or the economy overall.
2. PaaS programs cannot contribute to compliance with existing waste, ecodesign or sustainability regulations because the requirements focus on linear consumption and provide no incentives for PaaS.

The disconnect between the existing sustainability regulations and existing PaaS practices means that any recommendations for policy changes would be purely speculative. Rather than throw up our hands in exasperation, we note that while sustainability regulations have little practical impact on sustainable business practices like PaaS, they have a strong relationship with the pre-modern legal traditions.[11] Civilisations from ancient Rome through the present have established similar policies – collectively known as "sumptuary laws" – intended to stop unsustainable consumption by restricting consumer access to decadent or extravagant products.

These sumptuary regulations have a long and well-documented history of failure[12], and our survey indicates that circular economy regulations in their current form will fail for the same reasons. These regulations only seek to reduce the consumption and disposal of individual products in specific locations, not the global consumption of material and energy or the disposal of products in general. For regulations to succeed (in the sense of having high levels of compliance and consistent enforcement,) they must be based on a shared, physical infrastructure, such as public highways, waterways, airways, radio spectrum and financial currency. Without a physical, permanent reference point, legal restrictions are either unenforceable or easily evaded through recharacterization of the subject matter. Sumptuary laws regarding fashion had to identify the offending articles, leading consumers to simply find new fashion trends or flout the law to show that they outrank the enforcement authority[13].

Where infrastructure is publicly available and sharing is a physical necessity, as in the radio spectrum, regulations are not only accepted by industry, but demanded[14]. As ETSI (European Telecommunications Standards Institute) notes, its 2.4 GHz wi-fi standard "defines a number of spectrum related requirements that are not based on regulatory requirements but have resulted

[11] Beebe, B. (2010). Intellectual property law and the sumptuary code. Harvard Law Review, 123(4), 809-889.
[12] Kovesi Killerby, Catherine, 'Problems of Enforcement and the Failure of Sumptuary Law', *Sumptuary Law in Italy 1200-1500*, Oxford Historical Monographs (Oxford, 2002; online edn, Oxford Academic, 1 Jan. 2010), https://doi.org/10.1093/acprof:oso/9780199247936.003.0008
[13] Kovesi Killerby, Catherine, 'Problems of Enforcement and the Failure of Sumptuary Law', *Sumptuary Law in Italy 1200-1500*, Oxford Historical Monographs (Oxford, 2002; online edn, Oxford Academic, 1 Jan. 2010), https://doi.org/10.1093/acprof:oso/9780199247936.003.0008
[14] Mazar, (. H., & Azzarelli, T. (2016). *Radio spectrum management : Policies, regulations and techniques.* Publisher: John Wiley & Sons, Incorporated, 2016-08-29

from many years of give-and-take between industry members rather than from ECC spectrum sharing studies."[15] This gradual alignment of industry and regulation around a shared, physical resource is what produces a sustainable regulatory environment. Indeed, even the most ardent critics of regulation would be reluctant to open the radio waves to free access, drive on roads without traffic rules, fly on unregulated airlines or convert all of their money to bitcoin.

As with roadways, airwaves and flight paths, the creation of effective regulation promoting circular business models will depend on shared infrastructure. Our discussions with industry and consortium partners indicate that the infrastructure for the sorting of waste into streams and transporting to the appropriate facility is inadequate. A functional system needs collection points that are accessible to all consumers, warehouses for waste and reusable goods, vehicles for transportation and staff with sufficient skill to ensure the correct redistribution. This physical system for sorting waste is missing from the circular economy regulations currently under consideration. In the absence of this critical infrastructure, there is no clear vision of who will ensure that equipment makes its way to the appropriate site for reuse, recycling or disposal or how they will do it without losing money. Existing electronic waste systems have not been provided with the resources required to sort equipment by type, reusability, or brand owner, which would be necessary for a viable circular model. Without this level of infrastructure investment, circular economy practices like PaaS are restricted to small, mostly local businesses that cannot scale up to compete with multinational supply chains, global distributions systems and splintered waste management streams. Without a physical infrastructure, the circular economy is only a metaphor for the mythical perpetual motion machine.

A Problem of Scale

The scale and profit margin of the existing PaaS businesses are too small to cover the overhead required to manage compliance or benefit from regulatory incentives. We note that the introduction of technical standards for PaaS models, certifications, or reporting requirements would be premature at this stage as these would only add to the administrative burdens of business models with limited overhead. The only regulatory recommendation that seems appropriate at present is to avoid more speculative policies such as the conflict minerals reporting policy:

> Disappointingly, more than six years after the Regulation was signed into law, and almost three years after the requirements for EU importers started applying, our overall assessment is that the Regulation has not achieved any notable impact along supply chains, let alone in producing countries.[16]

[15] https://www.etsi.org/deliver/etsi_tr/103600_103699/103665/01.01.01_60/tr_103665v010101p.pdf
[16] https://ipisresearch.be/publication/the-eu-conflict-minerals-regulation-high-stakes-disappointing-results/

This disappointment seems misplaced. The mystery of this policy is not why this policy is failing, but rather why policy-makers thought this data-based policy would have a physical impact. The most pressing regulatory change that is needed for sustainability is for policy makers to break out of their abstract dreamworld and take physical reality into account.

We cannot recommend technical specifications in line with the PaaS models currently on offer because we have no physical evidence of their scalability or their circularity at scale. One comment from our survey stands out in this regard. For material recovery and remanufacturing to be viable, it must be done in "low wage" countries. This comment reminds us that the primary barrier to a circular economy is the fact that design, production and consumption are isolated from one another, physically separated by oceans. A product may be designed in California, manufactured in China from materials mined in Rwanda, then purchased by a consumer in Italy and subject to corporate taxation in Ireland where the profits are declared. Each part of the process is subject to different regulatory regimes, social expectations and enforcement provisions.

This suggests that policy planning resources should be committed to an integrated approach to regulation across the policy areas of labour, immigration, consumer protection, and industrial practice, as well as the rule of law in the “low wage” countries where most manufacturing now takes place. In many “low wage” countries, existing legal requirements simply are not implemented or enforceable. In Bangladesh, for example, e-waste management laws are on the books, but the infrastructure for collection and environmentally sound recycling and disposal of e-waste does not exist, so e-waste handling is dominated by uncertified scrap traders.[17]

In August of 2023, Norion Consult produced a detailed report on product service systems (PaaS) in the Nordic countries.[18] Their findings are similar to our findings, but their recommendations illustrate the strong tendency in policy consultation to combine empirical business data with regulatory speculation. For example:

> While the WEEE Directive might not be relevant for all PSS solutions, it has relevance for all types of PSS models, as PSS solutions for electrical and electronic equipment can be found in both product-, use- and result-oriented PSS models, ... This makes especially use- and result-oriented PSS solutions interesting, as the PSS providers working within the field of EEE often keep costs and pricing down by acquiring and refurbishing used EEE products. (p. 34)

The report thus implies that PSS models might help with WEEE compliance. However, the data only indicates that PSS business often reduce overall costs by acquiring used equipment, not that it reduces the cost of compliance with the WEEE Directive. It is a conceptual leap to suggest that the cost savings from the acquisition of used equipment is “interesting” from the

[17] https://www.tbsnews.net/features/panorama/wasted-potential-e-waste-561538
[18] https://www.pssinthenordics.com/_files/ugd/7b9149_ea226c424c8f4c409bf25fd45ddd415b.pdf

perspective of OEM compliance with WEEE, which is realised when the product is placed on the market and not reduced by PSS.

Similarly, the Nordic report finds that the Waste Framework Directive has only a inchoate relationship with PaaS, and that the classifications systems needed for compliance may be detrimental:

> While there are no direct effects of the WFD on PSS models, the overall focus on reducing waste generation and increasing reuse and recycling favours many of the identified PSS solutions... However, some PSS providers facilitating the uptake of waste production are challenged by classification standards availability of upcycable materials due to the waste ownership system. (p. 32)

The point here is not to criticise this particular report, but to highlight a long term trend in environmental and sustainability research, which is to combine empirical financial and technical data with regulatory speculation. This approach allows for the development of arbitrary and ineffective regulatory responses that have little or no hope of establishing a sustainable global economy. Like the conflict minerals reporting requirements of the previous decade, the latest generation of ESG reporting, recordkeeping and supply-chain auditing requirements are too complex and lawyer-dependent to have a practical impact on the scalability of PaaS or sustainability on a larger scale.[19]

A Lack of Direction

Another disturbing trend is that sustainability policy seems to be stuck on the starting line. PaaS models for consumer products remain in approximately the same niches they occupied 20 years ago and 40 years ago and the approach from businesses and regulators remains to wait and see.[20] There may be more explicit programs supporting product reuse and recycling, but there are also far more products, bigger homes to put them in and more money with which to buy. The global economic circularity gap, i.e., the difference between consumption and recycling, is growing, not shrinking.[21] The existing policies may be preventing an increase in the unsustainability of the global economy, but they are not contributing to sustainability. The sticking point may be the demand for sustainability to pay for the transition away from linear consumption. The Nordic report suggests that improved circular economy surveillance and enforcement could save €28M with an investment of only €4M, while the current WWF brochure "Model Germany Circular Economy" assumes that circular economic models will be a net financial boost to the economy.[22]

[19] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32023R2772
[20] Oksana Mont, Arnold Tukker, Product-Service Systems: reviewing achievements and refining the research agenda, *Journal of Cleaner Production, 14*(17), 2006, Pages 1451-1454, ISSN 0959-6526, https://doi.org/10.1016/j.jclepro.2006.01.017.
[21] https://www.circularity-gap.world/2024
[22] https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Unternehmen/WWF-model-germany-circular-economy.pdf

These promises suggest that policy makers and research funding bodies are looking for a unicorn, a policy that solves a difficult problem at no financial or political cost. Writing in Mull und Abfall, Prof. Dr.-Ing. Christina Dornack notes that numerous strategies for a circular economy are already available, including the WWF brochure, but the political will to implement them has been lacking, perhaps due to the fact that the current legislation is not binding or ambitious enough. This notion of a lack of political will appears over and over again in the literature on sustainability without any indication of what "political will" means. It has become a kind of nervous tick, simultaneously assuring the reader that the author is aware of the political impediments to action while absolving the author of any responsibility for a political solution, which is really not at all within the ambit of research. We leave the politics up to politicians. The problem with this attitude is that politicians do not lack political will. The problem is that the will of politicians is what Hitler described as the "will to power" and politicians are absolutely full of it. The nervous tick of assigning policy failure to a lack of "political will" makes it possible to avoid broaching the real cost of effective regulation.

The current policy trend of “waiting for a unicorn” inspired a group of climate researchers to propose an end to climate research and IPCC reports:

> We call for a moratorium on climate change research until governments are willing to fulfil their responsibilities in good faith and urgently mobilize coordinated action from the local to global levels.[23]

The experience of climate research shows that there is no correlation between the quality of the available data and political policy. This suggests that sustainabiliy policy does not suffer from a lack of empiracal data, but from the lack of a conceptual connection between data and action. Rather than recommending additional policies with little hope of effective implementation or amendments to existing policies, we can only recommend that policy research turn away from data management and focus on physical integration between policy and practice. Circularity is not an independent feature that can be added to existing production lines or selected by consumers. Circularity depends on integrated policies from design through manufacturing and consumption to waste management.

Sumptuary Law and the Failure of Sustainability Policy

The theory of PaaS is simple. Manufacturers know what is in the products they build and how to dismantle them. If manufacturers maintain control of the products from cradle to grave, they will be able to reuse and recycle as much material as is physically possible, thereby saving the costs of raw material and construction and preventing waste. Our expectations in this project were that regulations requiring extended producer responsibility, ecodesign and chemical

[23] Bruce C Glavovic, Timothy F Smith and Iain White, Climate and Development, Vol.14(9), pp.829-833, 2022 DOI: https://doi.org/10.1080/17565529.2021.2008855

restrictions would provide an incentive for manufacturers to invest in PaaS as a compliance tool, as well as a way to secure the supply chain for critical raw materials and chemical management. What we discovered was that the reality of the manufacturing process is too far removed from regulatory compliance for there to be a relationship between the material supply chain and corporate compliance mechanisms. For the companies we spoke with, regulatory compliance was a paper trail that was only related to manufacturing and waste management in the abstract realm of reporting and fees. Our respondents indicated that they would be interested in using PaaS as a compliance tool, but there was no mechanism in the regulations. Meanwhile, the latest ecodesign proposal from the EU Parliament is little more than a regulatory vapor that kicks the can down the road to a future regulatory body to make the difficult decisions.[24] Our findings indicate that manufacturers and regulators are equally at a loss. Why?

Our hypothesis is that there is a mismatch between standard regulatory methodologies and the problem of unsustainable consumption in society as a whole. In particular, restrictions on what specific product categories that are available to the general public do not address the cause of excessive consumption. When luxury travel is booming and Oxfam reports that half of all material wealth belongs to the richest 1%[25], asking ordinary people to share washing machines and reuse clothing is more likely to inspire a populist backlash than communal support, as the French “yellow vest” movement proved.[26] In this economically divided social environment, mandatory sustainability regulations for consumer products take on the appearance of “sumptuary laws” that regulate consumption of goods in an effort to preserve the social hierarchy. Indeed, the failure of present policy initiatives to address sustainability echo the historical failure sumptuary laws, which have been introduced in various forms since ancient Roman times. These laws generally regulate what clothes may be worn, what food may be eaten and access to other luxury items to maintain objective class distinctions.[27]

> The history of sumptuary law has been a bizarre one. Consider the Japanese decree of 1668 that provided that "puppet costumes must not be sumptuous. Gold and silver leaf must not be used on anything. But puppet generals only may wear gold and silver hats." Or consider a sumptuary ordinance of seventeenth-century Nuremberg that lamented that "it is unfortunately an established fact that both men- and womenfolk have, in utterly irresponsible manner, driven extravagance in dress and new styles to such shameful and wanton extremes that the different classes are barely to be known apart." Most remarkable, perhaps, is the behavior of the Venetian Senate. In 1472, it called for the appointment of supervisors of luxury, to enforce the state's sumptuary laws, and in 1511, it issued, not for the last time, a decree to the effect that "all new fashions are banned ... Henceforth no new fashion that may be imagined or told shall be suffered." The next

[24] https://www.europarl.europa.eu/doceo/document/TA-9-2024-0303_EN.pdf
[25] https://www.oxfamamerica.org/explore/stories/richest-are-getting-richer-1-will-own-more-than-all-the-rest-by-next-year/
[26] Hamdaoui, S. (2022). Anti-populism during the yellow vest protests: From combatting the rassemblement national to dealing with street populists. *British Journal of Politics & International Relations, 24*(3), 493-510. https://doi.org/10.1177/1369148120974014
[27] Kovesi Killerby, Catherine, 'Introduction', *Sumptuary Law in Italy 1200-1500*, Oxford Historical Monographs (Oxford, 2002; online edn, Oxford Academic, 1 Jan. 2010), https://doi.org/10.1093/acprof:oso/9780199247936.003.0001, accessed 19 Apr. 2024.

> year, as the powerful League of Cambrai prepared to attack, the Senate found itself debating sleeve widths and shoe designs. ... These laws were almost invariably ignored, circumvented, or openly defied -- so that an eighteenth-century London stage character would declare: "I don't care for it, now it is not prohibited." Indeed, the history of sumptuary law is filled with the likes of one Hannah Lyman, who, in 1676, chose to appear before a court in Northampton Massachusetts, in the very dress that she was proscribed from and there being tried for wearing.... Societies have regularly imposed such controls when their governing classes come to believe that too much of their society's wealth is being wasted on conspicuous or decadent forms of consumption. Beebe, B. (2010). Intellectual property law and the sumptuary code. *Harvard Law Review, 123*(4), 809-889.

Explicit sumptuary laws died out in the 18th century with the uncontrollable explosion of trade and fashion during the industrial revolution. However, Beebe notes that sumptuary effects have been incorporated into intellectual property law, arguing that generic restrictions on commerce and consumption produce the same class-defining distinctions as overtly class-based restriction on luxury items. The transition from specific to industrial sumptuary codes can be seen in the sumptuary laws of colonial Portugal. In the 18th century, the governor of Portugal's Indian colony requested that the King introduce a sumptuary law to serve the social purpose of distinguishing rich from poor and the economic purpose of making more resources available to the colonial administration.[28] While the local governor was primarily concerned with the decadence of his colonial subjects, the Foreign Council in Lisbon saw an opportunity to protect the interests of Portuguese merchants from international competition. Thus, the resulting law restricted textiles and other luxury goods produced in European countries other than Portugal in addition to the more typical restrictions on gold and silver adornments and extravagant funeral expenditures.

Beebe argues that intellectual property law is uniquely suited to carrying out the sumptuary purposes of class distinction and wealth preservation. However, our review of sustainability regulations and their failure to promote sustainable business practices suggests that their ultimate effects are more sumptuary than sustainable. The strange history of sumptuary law suggests that any type of law related to trade in goods and services may be imbued with sumptuary elements or implemented in a way that restricts access to the appearance of high social status. As Sparky Booker notes, these laws are both universal and universally ineffective:

> Economically protectionist sumptuary law, frequently couched in patriotic language, survives from Germany, Scotland, England, and the Italian cities. The central aim of most of these laws, however, was to make each person's status visible through their dress and to ensure that their appearance did not misrepresent their place in society.

[28] Chaturvedula, N. (2015). On the precipice of ruin: Consumption, sumptuary laws, and decadence in early modern Portuguese India. *Journal of World History, 26*(2), 355-384. https://doi.org/10.1353/jwh.2016.0033

> Legislators attempted to impose through clothing and other visual markers an idealized and neatly ordered social world that did not exist in reality.[29] (p. 727)

Rather than lump sustainability regulations into the category of doomed sumptuary laws, it is important to recognise that these types of laws emerge in all legal domains because they are easy to draft, perfectly comprehensible, and unlikely to elicit powerful opposition. Sumptuary laws have the simple clarity of Rudyard Kipling's "just so stories", like how the elephant got its trunk when the crocodile bit the end of its nose and stretched to its present length. The point here is not to abolish regulations, but to carefully consider the prevailing impulse to draft laws in the form of restrictions on general consumption. These laws do not fail due to a flaw in logic or intention, but a failure to seriously investigate the problem they are designed to solve.[30] The point here is not to recommend deregulation in general, but to carefully consider the prevailing impulse to draft laws in the form of restrictions on consumer goods. Excessive consumption is driven by competition for social status, not the design of basic consumer products. According to Oxfam, "The richest 1 percent of the world's population produced as much carbon pollution in 2019 as the five billion people who made up the poorest two-thirds of humanity,"[31] Restrictive measures and standards for consumer products will have little effect under these circumstances, just as sumptuary laws have consistently failed to curb extravagant consumption. Rather, what is needed for sustainability is aggressive support for common infrastructure and community spirit. We appreciate that this is almost unimaginable in the present ethos of technocratic "progress", but this is the work before us.

[29] Booker, S. 2021. Moustaches, Mantles, and Saffron Shirts: What Motivated Sumptuary Law in Medieval English Ireland? *Speculum 96*/3. doi: 10.1086/714426, 0038-7134/2021/9603-0004

[30] Kovesi Killerby, Catherine, 'Problems of Enforcement and the Failure of Sumptuary Law', *Sumptuary Law in Italy 1200-1500*, Oxford Historical Monographs (Oxford, 2002; online edn, Oxford Academic, 1 Jan. 2010), https://doi.org/10.1093/acprof:oso/9780199247936.003.0008, accessed 21 Apr. 2024.

[31] https://www.oxfam.org/en/press-releases/richest-1-emit-much-planet-heating-pollution-two-thirds-humanity#:~:text=Richard%20Wilk%20and%20Beatriz%20Barros,is%20approximately%205%2C959%20tons%20CO2