

Article

# Seeking Control in a Precarious Environment: Sustainable Practices as an Adaptive Strategy to Living under Uncertainty

Stefana Broadbent <sup>1,\*</sup> and Francesco Cara <sup>2</sup>

<sup>1</sup> Department of Design, Politecnico di Milano, Via Durando 38/A, 20158 Milano, Italy

<sup>2</sup> Cleanweb Ltd., Chase Side Southgate, London N145BP, UK; francesco@iywto.com

\* Correspondence: stefana.broadbent@ucl.ac.uk

Received: 27 March 2018; Accepted: 22 April 2018; Published: 24 April 2018



**Abstract:** Our societies and our economies are struggling to transform in response to the climate crisis with the speed and intent that the rapidly deteriorating environmental situation requires. Resistance to change is invoked as one of the reasons for the slow adoption of new sustainable practices. In this paper, we argue that the transition to sustainable behaviors is part of a wider adaptation to the new uncertain and precarious conditions of contemporary living and this constitutes a unique opportunity for rapid cultural change. The analysis of a growing innovation space that is at the crossroads of digital transformation and ecological transition shows that the digital culture of sustainability actually goes hand in hand with the changing practices emerging from an increasing economic and professional precariousness. Since the invention of the world wide web, we have seen that digital innovation is an accelerator of cultural change. When applied to the ecological transition, will digital innovation create the conditions for an equally rapid and profound transformation of practices? To start exploring this question, we built a dedicated research tool called If You Want To that collected several thousand digital environmental projects. Our initial findings suggest that this wide landscape of services enables new sustainable forms of exchange, collaboration, consumption, and production, giving rise to alternative social, environmental, and economic models.

**Keywords:** sustainable lifestyles; digital services; innovation; citizen science; behavioral change; precariousness

## 1. Introduction

A common argument in the field of sustainability is that awareness of climate change is not enough to trigger significant lifestyle modifications [1–3]. Studies in Europe and the US show, for instance, that even with high rates of climate change awareness and concern, the only behavioral transformations that are systematically reported regard recycling and energy efficiency [4–7]. A common explanation is that people modify “low cost” practices such as organizing waste, but are less willing to change behaviors that add a burden of time or effort to their lives such as changing their modes of commuting, heating, or travel [8]. Simpler actions such as choosing energy-saving appliances satisfy the moral imperative of contributing to the reduction of carbon emissions without disrupting fundamental patterns and habits of living [9]. The starting point for most of this research, however, is the idea that people perceive themselves as living in stable situations and that they fear destabilizing the existing equilibrium. Within this framework, the objective therefore is to understand the mechanisms, be they psychological, social, or economic, that will trigger and sustain behavioral change in a positive direction. Policies, group pressure, nudging [10] education, regulations are all instruments envisaged to help people transition from their current lifestyle to a new equilibrium characterized by a more sustainable set of practices.

There is a growing body of sociological and anthropological literature that describes the social situation following the globalization process started in the 80s, as one of perceived precariousness and not stability. Recent forms of modernity are being characterized by an increasing sense of risk and unpredictability [11–13], greater mobility [14] and uncertainty [15,16]. In practice this means that, in Europe, young people, in particular, have discontinuous periods of employment and irregular incomes [17], alternate periods of employment and self-employment, have non-linear careers, fewer safety nets from the welfare state, are less likely to be able to purchase a house, are less likely to accumulate some capital, etc. In order to cope with these discontinuities in life patterns, we are witnessing the emergence of new forms of distribution of risk. Young people live longer with parents [18], live in hostels, share houses and workplaces, work from home, own fewer goods and create strong personal networks of support. All these phenomena can be read either as forms of economic deprivation or as ways to reconfigure the social space in order to socially distribute the new economic and professional demands [19,20]. More recently, as people become more aware of climate change, it is not only the professional and economic worlds that are considered unstable and unpredictable. Increasingly even the natural world is perceived as changing along lines that are impossible to anticipate. Politically, the effect of a sense of precariousness has been invoked to explain a new form of populism and disengagement from the public sphere [21,22].

However, another characteristic of the current domain of experience is the fact of belonging to a digitally enabled networked public [23]. The extensive use people across generations have had of the web and online social networks, has laid the ground for new forms of networked collaboration that will be far more complex than those we have seen until now [24,25]. Increasingly, we can see people relying on digitally enabled services and collaborating with diverse, distant and occasional contacts to carry out a growing range of activities such as sharing knowledge and experiences or exchanging goods [26,27].

The argument we would like to make in this paper is that if we accept that precariousness rather than stability and continuity are the defining state of most people, our outlook on sustainable transition may be very different. Rather than having to discover how people and social groups can be encouraged or coerced into exiting from their current stable behaviors, we can look at the role sustainable practices play in supporting a lifestyle that is already more fluid. Many sustainable practices such as car sharing, cycling, or transforming consumption, are already compatible with lifestyles where the lack of a predictable and continuous income makes it impossible and undesirable to commit to long-term loans and recurring expenses. Owning a car, having a mortgage, are only possible with a continuing stable income. Flexible, shared, on demand, services that take advantage of the distributed nature of the web, are a solution to discontinuous and unpredictable conditions and the rapid success of some of the better known sharing services such as Airbnb, Uber, or Blablacar have extensively proven it [28–30].

However, sustainable lifestyles are predicated on more than just flexibility, they tend to modify the patterns of consumption putting people in much more active roles. Goods are bought but also sold, rented, shared, refurbished. Food is eaten but also grown, analyzed, shared. Energy is consumed but also produced [31,32]. In this fluid society, people move in and out of different roles as consumers, producers, investors, recipients, and givers. This multiplicity of roles that can coexist in the same person or household, corresponds exactly to experiences of a generation which weaves in and out of different professional and living situations. Sustainable practices, therefore, are often perceived as a source of empowerment and regained control because they offer a coherent response to concerns about health, cost, use of resources and protection of the environment and they do so from a vanguard point of increased agency and well-being [33–35]. As the Psychology of Sustainability is proposing, solutions are sustainable when they are addressing environmental, economic and social issues but also promoting the well-being of individuals and are doing so by offering opportunities for growth and enrichment [34].

There is a field of innovation that has recently emerged, that strives to provide the means, tools, and products to be an active participant in a sustainable economy [36–38]. All over the world we see cropping up sustainable services in the areas of soft mobility, renewable energy production, food system, natural and recycled materials, green fashion or energy efficient housing which rely on the internet as an infrastructure that allows to reconfigure the cycle of production, distribution, ownership and disposal of goods [39,40]. These innovations espouse the open, distributed, connected, nature of the web as a way to dis-intermediate the relation between producer and customer, to create new networks of exchange and knowledge, or to blur the boundaries between producers and users [41].

Enquiry into this emerging world of green start-ups started under the name Cleanweb [38,42] and has given rise to Cleanweb Meetups in London, Boston, Israel, New York, San Francisco, Scotland, Cleanweb conferences (e.g., Ecosummit) and hackatons (e.g., The Cleanweb Initiative). Masero and Townsend describe Cleanweb as: “ . . . the sector sits at the intersection between cleantech, web technology, the Internet of Things and Collaborative Consumption. It combines technology innovation, new business models and commercial sustainability objectives with reducing our impact on the environment. These technology businesses are transforming the way their customers activate environmental change” [38].

As a space of innovation, it represents a radical departure from dominant and traditional approaches to sustainable behavioral change grounded in education and regulation [43,44]. It mixes modes of engagement, using communication, commerce, knowledge dissemination, production, collaboration, etc. It lowers the barriers to innovation by supporting the exploration of new ideas and the development of products at significantly lesser costs [45], and it relies on openness and collaboration by making new propositions part of a public discourse. At the same time, and from the perspective of culture, this innovation space creates an imaginary alternative, sustainable way of living and a set of sustainable solutions to enact the new practices that embrace environmental concerns but also social justice [35,46]. Behavioral change, therefore, is driven by action through the exploration of new practices, emulation of observed behaviors and construction of new tools all happening within a social arena characterized by intense communication, sharing and collaboration [47].

## 2. Methods

### *Mapping the Emerging World of Digital Environmental Start-Ups*

Where digital and ecology meet, we find a very active community of innovators building a large set of native (apps) and browser-based (websites) software applications that create new opportunities to learn, make, exchange and take part in collective action. As a relatively recent, and still poorly documented, domain of innovation, our first task was to gather a unique corpus of data. Building on existing taxonomies [48,49], we developed a database and a set of collaborative research tools on a dedicated software platform, called If You Want to (iywto.com).

To populate the database, we adopted a citizen science approach and partnered with volunteers to find and collect cases, refine the data collection criteria, improve the database structure and help us to set the research priorities. Thanks to their contribution, we have been able to gather information on a much larger scale than initially predicted. The core group of volunteers was formed by experts from the Cleanweb Meetup in London, who were subsequently joined by other activists who started spotting and adding projects, ratings, and reviews.

To make the process of contributing to the platform as open and simple as possible, we developed a dedicated suite of web tools. New projects can be added to the database directly from If You Want To landing page by copy-pasting the url of the project page. The information is immediately made available in the directory which can be seen by everyone, searched and browsed. The only identification from contributors requested is an email address, so that the contribution can be acknowledged. Regular contributors can also use a browser extension, downloaded from the If You Want To website and installed on Chrome and Firefox browsers. Once installed, one click on a relevant project will

automatically create a new entry in the directory with the project url. The database itself is editable so that a description of the project and geolocation information can be provided at a later stage.

Since the public launch of the IYWTo platform in April 2016, we collected over 6000 services and projects. The projects have been collected by a core group of about 10 independent contributors, each with their own centers of interest, and by a large number of individual contributors. Some contributors, who are keen on energy efficiency, renewables and mobility, primarily identify innovations in those areas. Others focus on social innovation and particularly the many forms that the sharing economy takes. Others cover innovation in sustainable fashion, beauty, and personal care, while nearly all contributors collect projects in the food innovation space. Because of this plurality of perspectives, we work under the assumption that the distributed nature of data collection together with the relatively large number of datapoints should limit the risk of strong biases towards certain areas or domains. As we progress with the analysis of the database, we will be able to integrate even more perspectives and reduce the risk of biases even further.

Concerning the validity of each entry in the database, there are number of verifications being carried out systematically. First of all, we verify that the url corresponds to a real project by cross-checking media sources. Then we verify that the project is active by reading the latest posts on social media, and in case of a doubt we contact the project owner. Finally, we verify that the stated objective of the project is indeed within the scope of digital environmental innovation, that is, digital plays a central role in the way it operates and the project contributes to limiting emissions, environmental degradation, and in some cases, to regeneration.

A subset of the overall projects present in the directory are developed further as dedicated pages for people to browse and discover. Over time about 1000 projects from the IYWTo repository have been presented in greater detail with text, images, and videos. Typically, a project page includes: a long textual description; a classification of the project in terms of level of maturity (1—proof of concept; 2—release to market; 3—consolidation within a market; 4—expansion to new segments or geographies); the project's contribution to reducing environmental footprint, generating financial gains or savings, and creating social relations; the country where the project originates from; the type of digital technology used; a video presentation of the project, when available in the public domain; a video interview with the founder, when available in the public domain; links to the project landing page and dedicated text boxes to rate and post reviews, comments and observations regarding the project.

The purpose of these one page descriptions is to stimulate the interest of users to go and visit the website of the project. For the last 12 months, there have been around 1000 users of the website a month coming from all over the world.

Most of the products, services and organizations are quite specific in their goals. While they all share an overall objective of contributing to solving the climate crisis, they inscribe their projects in particular areas of intervention such as the transformation of the modes of soil exploitation or the adoption of renewable energy systems, or the reduction of emissions from transport, etc. Each project can therefore be positioned within one domain of socio-ecological transition [43,50,51]:

1. Shifting from electricity and heating generated from fossil fuel to renewable sources of energy.
2. Moving from growing and eating industrial food to organic, local food systems.
3. Switching from combustion engine transport to zero or low emission types of mobility.
4. Moving from a take, make, dispose culture of production and consumption to a culture of making, repairing, reusing and recycling.
5. Converting to a green ethical finance that looks beyond financial performance into corporations' environmental, social and governance responsibility.
6. Enabling conscious consumption choices with products made to have the lowest possible impact on the environment and the best possible impact on society.

7. Supporting the shift to a proactive attitude towards climate change, environmental degradation, social inequality expressed through participation in campaigns to respond to climate crisis, social injustice and in actions for environmental preservation and regeneration.

Each project has its own way of activating and mobilizing their public. The complexity and sheer size of many of the societal transformations required to transition to lower impact lifestyles, means that there are multiple routes and components to support the change. For instance, energy transition can be approached by becoming a producer of renewable energy using rooftop solar panels; by switching, as a consumer, to a renewable energy supplier; by buying energy efficient devices, like LED bulbs or software systems to manage and optimize energy consumption, etc. We therefore added a second dimension to our project classification in terms of the mode of engagement with the socio-ecological transition it affords:

1. Consumption, meaning the purchase and use of new, second-hand or refurbished products and the subscription and access to utilities and services, that include rental, exchange, sharing of goods.
2. Production, meaning the action of making goods and delivering services independently.
3. Prosumption, meaning the direct exchange of goods and services between individuals through peer-to-peer platforms that bring together communities of people who buy, sell and exchange goods and services without the intermediation of traditional commercial structures.
4. Activism, meaning the contribution to collective campaigns to address social and environmental issues and take practical and political action to improve the state of the world.
5. Learning, meaning the process of acquiring a better knowledge of the climate crisis, its causes and the ways to mitigate and adapt to it.

### 3. Results

The data analyzed in this study consists of the last 2000 entries in the IYWTo repository of services. The pace of innovation in this space is so rapid that it was important to take into account the latest innovations. The 2000 entries were collected and validated between May 8th, 2017 and February 15th, 2018. We have summarised the data from the analysis of the entries in the IYWTo, in Table 1 showing the frequencies for the 7 socio-ecological transitions and the frequencies for the 5 modes of engagement.

**Table 1.** Number of services and projects in transition and activity categories.

	Making Recycling Repairing	Climate Action	Energy Transition	Sustainable Food	Green Finance	Low Impact Products	Low Emission Mobility	Total
Activism	39	112	16	57	8	36	9	284
Consumption	14	16	63	246	59	551	147	1087
Learning	14	62	28	83	13	105	33	340
Production	46	21	45	58		18		186
Prosumption	37		15		12	15	22	103
Total	153	211	167	443	93	722	211	2000

#### 3.1. Analysis

##### 3.1.1. Consumption

More than 50% of the services in the database are of a transactional nature meaning that they are designed to allow users to purchase or rent goods and services. What this data suggests is that the bulk of innovation is embedding sustainability in economic processes. In this space we have definitely moved away from traditional environmentalist movements engaged primarily in awareness raising and policy-making with a view on reducing consumption [52]. Producing and



selling compostable cups is as much part of the fight against single-use plastics than campaigning to bring back water fountains in cities. These services transform the consumption patterns of their customers but also the production processes and therefore participate in modifying both the material culture [53] and the business culture. In a field where the strongest impact is determined by the excessive consumption and waste of resources any modification of these processes in the direction of greater environmental and social sustainability, are profoundly transformative. They do so however recognising that consumption is a cultural process and that attempts to simply curb it fail to recognise its social significance [54]. The most powerful innovations come from transforming the processes, materials and cycles in a sustainable direction. Consumption therefore spans across the ecological transitions in food systems, mobility, energy and goods with services covering the full range of everyday needs.

### 3.1.2. Learning

The services that are focused on learning are characterised by two very different types of projects: those that show, explain and discuss how to do things such as cooking vegan, growing vegetables or building solar installations, and those that offer access to climate and environmental data. The latter usually created by large organizations and scientific institutes share data that is difficult to obtain on conventional media. The former continue a longstanding tradition of the web to empower users to make, repair and produce autonomously. Transferring knowledge, raising awareness, sharing data are all functions of digital media that are associated with environmentalism and civic participation. Here we find also the instructional and editorial material that are typical of blogs, online social media and reviews. Learning is completely transversal to all the ecological transitions and represents 17% of the services of the sample we analyzed.

### 3.1.3. Activism

Many organizations aim to engage users in campaigns for preserving or regenerating the environment, and are run by well-established global organizations. The internet allows very local initiatives to also have a presence. These organizations sit on a long tradition of green and civic engagement and are the “public” face of the innovation space we are describing. They tend to follow the structure of most digital systems of participation: allow users to “acquire and process information relevant to formulating opinions about civic matters, to voice and debate opinions and beliefs related to civic life within communities or publics, and to take action in concert and/or tension with social institutions such as political parties, government, corporations, or community groups” [55]. There are also other forms of activism that are related to novel forms of participation as a community, for instance to produce community energy, to run community gardens, repair workshops etc.

### 3.1.4. Production and Prosumption

Production and prosumption [56] services put users in the position to be economic actors producing autonomously some of the goods and services needed in daily life such as energy and food, or renting and sharing some of their assets. Platforms for helping people produce, distribute, sell or buy everything from energy to clothes, agricultural produce or beauty products are designed to put users in the dual role of producer and consumer. Nearly 300 services are using the internet to put people in a position to actively participate in an economic process of production, reuse, retail. In a period of considerable precariousness the possibility of becoming an economic actor is very significant. The projects here are only in part what we would qualify as sharing economy; in many cases they offer solutions on how to enter a network where production, consumption and retail are combined. Some of the best cases will be illustrated below in regards to energy.

#### 4. Case Studies of Sustainable Innovation That Meets Precarious Lifestyles

A more detailed analysis of some services in different domains tend to show common patterns that go beyond the goal of reducing emissions and human impact on the environment. Most services and projects are based on principles of co-production, suggest a transition towards use rather than ownership, make an intense use of horizontal networks, empower users with knowledge and tools, and often blur the roles between producer and consumer. In the domain of energy and food there is a definite strand of innovation to transform consumers in producers. In mobility most projects are attempting to reduce car ownership and support soft forms of mobility. Household goods, fashion and apparel see innovation in various forms of circular economy to prolong the lifecycle of goods or make use of recycled materials. The movement towards waste reduction is often accompanied by a valorization of waste. All of these approaches are in our view predicated on cultural models that redefines people's relation with the production, use and disposal of the items and services that they engage with. More importantly they also redefine their roles and tend to include them as active rather than passive participants of these cycles.

##### 4.1. Innovation for Energy Transition: Rooftop Solar, Community Energy, Smart Grids

The big driver of innovation in the energy space is empowerment, or how to create the conditions for households, farms, businesses, organizations, communities to generate their own renewable energy. Some innovations are very much about technology solutions but most are integrated with new ways of becoming autonomous from centralized utilities [57,58]. In the database we find micro-charging stations for electronics using solar (*yolk* and *sunslice solar*), hydropower (*Enomad*) and wind (*Waterlily Turbine*); and solar-powered lighting (*awango*, *Mpowered*). New ways of generating solar power using roofing tiles (*strauss energy*), smart blinds (*solar gaps*) and all-in-one installations (*smart flower*, *etree*). Somewhat larger installations to generate biogas from food waste for heating and electricity (*homebiogas*, *Brood Nodig*), alternative geothermal heating and cooling solutions (*Dandelion Energy*) as well as heating solutions using server farms (*nerdalize*). There are new batteries and systems to store solar energy in the home such as *moixa* and *power vault*, and small appliances that run or capture solar power such as backpacks with integrated solar panels *voltaic*.

The second main driver of innovation is business models: or how to finance new renewable energy installations, and specifically rooftop solar systems. The solutions proposed range from leasing of solar panels to third parties (*the sun exchange*) to micro-payment loans, like *m-kopa* and *fenix*, to contracts where part of the energy produced is sold back to the grid (*reposit power*). In these cases, we see complex networks of relationships emerging around energy producers, connecting them with energy utilities, financial institutions and energy consumers that can lower the initial solar investment and even transform it in an additional source of revenue.

##### 4.2. Innovation in Transport Services: Driving Cars and Riding Bicycles

This is the domain in which innovative services are uniquely reliant on digital technology but also where we see a high integration with approaches to mobility that are more flexible, opportunistic and less dependent on ownership. Innovations put forward a number of alternative, low-emission modes of transport, as well as solutions to reduce emissions with conventional modes of transport. Digital systems are the center of new networks connecting drivers, passengers, cars, bicycles and service providers, through identity, reputation, geolocalization and payment systems.

Bike, scooter, car sharing and different forms of ride sharing have become an integral part of the contemporary urban landscape and play an essential role in the transition from owning to using cars. At the same time, they create opportunities to lower transport costs and open new sources of revenue generation through rental of one's vehicle on peer-to-peer platforms (*go more*) or picking up passengers for short (*wayzup*) and long distances (*blablacar*). Apart from the global success of bike sharing schemes now from offering electric bikes and more flexible dockless schemes, we have encountered

new bicycle-as-a-service propositions (like *swapfiets*) and a new generation of artisan bike makers connecting to their market directly with the web, and building bikes using natural materials, like bamboo (like *Ghana Bamboo Bikes Initiative*) or wood (like *Renovo*), saved materials (like *Roetz*), or cargo bikes of any form and size (like *portal bikes*). We have come across many new forms of bicycle servicing: from on-demand, on-site repairs and maintenance (like *ridy*, *nipnip*), to community workshops that provide jobs for people long-term unemployed (*radhof*).

#### 4.3. Innovation in Recycling, Making, Repairing

Another strand of innovation revolves around recycling and upcycling materials. This is a transversal trend which touches clothing, building material, food, electronics, bicycles as we saw above, and others. The principles are always very similar in the sense that the services attempt to extend the life of goods and materials and reduce waste. It is done by repairing, exchanging, donating, putting goods in common, using discarded materials to create something new or simply transforming largely available waste into components of other products. This area really is at the crossroads of sustainability and precariousness as it transforms ownership into use, it empowers citizens to participate in the production and maintenance of the goods they use, and in many cases allows financial gains and savings.

The network of *Repair Cafés* where workshops are regularly carried out to repair electronics, toys, and household items has extended all over the world and now count 1300 outlets.

In fashion there are hundreds of new startups that use the web to distribute jeans, eyewear, bags, swimwear, shoes all made using recycled materials. *Re/Done* makes jeans from vintage Levi's denim. *Biloum* creates bags and accessories from banners, airbags and boat sails. *Uptitude* makes glasses from old skis and snowboards. *Indosloes* shoes use soles made of repurposed tires. *Davyi* makes swimwear with 100% regenerated nylon yarn from waste including spent and ghost fishing nets. These are cases where an innovative use of materials can lead to the creation of new businesses.

Always in fashion there are platforms to buy and sell second hand clothes and accessories. To mention a few of the better-known ones: *depop*, *vestiare collectif*. There are more and more services supporting the shift from owning to using clothes by putting together large garment collections to rent. Two examples is the Chinese company *Duolayimeng*, which has a collection of 500,000 garments to rent; another is *Hylla* that offers a large collection of vintage clothes.

In the construction sector there are a number of platforms to find or make available salvaged and surplus building materials, like *Loop* or *Recipro* in the UK. There are organizations that collect and pay for used plastic to make into construction material. *The plastic bank* rewards people who collect plastic in vulnerable communities. Plastic waste collected is payed for and is then recycled. Similarly, *Wastedlab* in the Netherlands rewards people who bring waste materials with discounts in local shops and cafés.

In food systems there are many projects aimed at reducing food waste along the value chain. In the If You Want To database, we find projects designed to bring back into the market fruits and vegetables discarded because of non-standard shape, form, colour or size as juices and snacks (*imperfect fruit*, *snact*). But also projects focused on making sure that surplus or soon to expire foods is redistributed within the local community and among food banks to reach fragile people. Examples include *Olio*, *Foodcloud* or *Bonapp*, the *Real Junk Food Project*, just to mention a few. Restaurants and shops advertise their soon to expire food or the food that may go wasted on apps such as *too good to go*, *last minute sotto casa*. There are maps for foraging fruit from trees, and an increasing number of platforms that bring together people who want to grow vegetables and people who own small plots of land or gardens (*Lend and Tend*, 3000 acres). The movement towards urban growing is expanding considerably both with the success of allotments and as private or community initiatives such as *Sow the City*, *the Big Dig*, *Plantez chez Nous*.



Object banks or libraries are also present in various cities to put in common tools and household goods for people to share and use. Just a few examples are the *Edinburgh Tool Library*, *Sharevoisin*, *Streetbank*.

## 5. Discussion

At the convergence of digital transformation and ecological transition, we have found a very large and diverse range of products and services that support the development of new sustainable behaviors. Products and services that reduce emissions, use recycled materials, limit waste, help to make, grow and repair and contribute to the regeneration of the environment. The prime objective of these initiatives is to have a direct environmental impact, however these services also establish the conditions for greater agency [19] and increased well-being in many key aspects of contemporary living, for instance, supporting the shift from passive consumption roles to the more active roles of learner, producer, farmer, retailer, maker. All of the projects rely on the networking power of the web to connect users, consumers to producers, citizens to institutions. While none of the services individually express the ambition of providing alternative solutions to financial or professional instability, jointly they delineate an ecosystem in which citizens can use networks to absorb some of the uncertainty. Transitional projects taken together outline a lifestyle that is more conscious and is highly networked but is also creating long-term resilience and well-being. Be it for energy, food, mobility, housing or leisure, the solutions that are offered increase the horizontal interrelation between different social actors generating opportunities for new types of activities and collaboration.

When analyzing the vast array of projects, there are a certain number of patterns which emerge across the services: the coexistence of consumption and production roles, the primacy of networks, the importance of social as well as environmental sustainability, transparency of processes, an appeal to ethical principles, a focus on services alongside products, the transfer of knowledge, dis-intermediation in economic transactions. Some of these features are derived from the digital nature of the services such as the importance of online networks, the entwining of services and products or the potential for sharing knowledge and information. Other characteristics such as the blurring of production and consumption roles, are common to most services in what is generally characterized as sharing economy. Other practices, however, are particular to this domain such as forms of consumption where “consumers” interact and transact directly with small and medium-size businesses that operate according to the principles of a circular economy, thus reducing production demand on environmental resources to the bare minimum. In this configuration consumers are invited to exercise critical forms of consumption choosing among alternative products and supporting new economic actors that make a living from products and services built sustainably. Similarly many sustainable digital services support the re-appropriation of making, production, repair and reuse in a social learning context where people learn new skills within communities of practice. The culture of doing and learning to do, which in the digital sphere is generally associated with the open source movements, in this arena challenges traditional forms of consumption based on cycles of make-sell-dispose and creates opportunities to save and earn money, develop new professional skills and social networks. Finally, a common thread across the projects is activism. We have seen that there are many initiatives which explicitly canvas for participation and are borne from environmental and civic movements. However even for those projects that have a commercial objective, the environmental ethics which permeates the majority of the services is predicated on a culture of participation.

To return to our initial question about the potential for digital services to accelerate ecological transitions as they have done in the past for other social and economic transformations, we would argue that these services are already inscribing themselves in a profound cultural transformation of which the environmental component is one of the facets. In fact, the compatibility between the logic of sustainability, the condition of precariousness, the elaboration of novel forms of agency, is what is contributing to the rapid adoption of some new practices be they in mobility, food or consumption and is creating the conditions for a cultural transformation.

## 6. Conclusions

In this study we presented the first exploration of the data collected on the citizen science platform If You Want To, designed to map the emerging world of digital environmental innovation. In the lapse of 18 months we have collected more than 6000 services, products and projects that use the internet to support a wide range of sustainable practices. This number far exceeds our initial expectations and is constantly growing as contributors add new projects, suggesting that this is an area of innovation which is worthy of attention. We have found this to be a very generative domain of inquiry for a number of reasons: the projects and services are “in the wild” or open in the market and are not niche sites of experimentation [59,60] thus offering a view of where behavioral change is happening from the perspective of innovators, entrepreneurs and activists. Secondly, the analysis of the intersection of digital services and sustainability reveals a new approach to environmental engagement that is embedded in daily action and represents a radical departure from traditional environmentalist movements. Thirdly many of the services are exploiting the best features of the Internet to enable openness, dis-intermediation, networking, and collaboration, thus transferring by default some characteristics of digital culture into sustainable services. Finally, a closer analysis of the projects reveals that they are designing economic and social processes that inscribe themselves in the emerging patterns of behaviors that are responding to the increasing sense of precariousness and uncertainty [34]. The overlap between these two “cultures” is in our view an opportunity for accelerating behavioral transformations.

This research programme will continue with an investigation into the assessment of the actual contribution that these products and services make towards reducing emissions and environmental degradation. We will also examine the usage data from the platform and cross it with the ethnographic research we carried out in London in 2017 on the daily practices of people who are negotiating their concerns about climate change with urban living. The usage data from the thousands of visitors to the platform should reveal which are the main preferences and priorities.

As an open collaborative platform, IYWTo is a continuously evolving corpus of data on digital environmental innovation available to researchers that want to study this newly developing domain. It is also a dissemination platform that promotes the most transformative projects across a number of channels, so as to contribute to give visibility and generate awareness of new opportunities for sustainable living to the general public.

**Supplementary Materials:** The IYWTo data is available on request. Furthermore, on iywto.com the directory of services is public and searchable.

**Author Contributions:** Stefana Broadbent and Francesco Cara wrote the paper jointly. Francesco Cara designed the platform IYWTo and analyzed the data from the database.

**Acknowledgments:** No grants received for the writing and publishing of this paper.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. Clayton, S.; Devine-Wright, P.; Stern, P.C.; Whitmarsh, L.; Carrico, A.; Steg, L.; Swim, J.; Bonnes, M. Psychological research and global climate change. *Nat. Clim. Chang.* **2015**, *5*, 640–646. [[CrossRef](#)]
2. Klöckner, C.A. A comprehensive model of the psychology of environmental behaviour—A meta-analysis. *Glob. Environ. Chang.* **2013**, *23*, 1028–1038. [[CrossRef](#)]
3. Steg, L.; Vlek, C. Encouraging pro-environmental behaviour: An integrative review and research agenda. *J. Environ. Psychol.* **2009**, *29*, 309–317. [[CrossRef](#)]
4. Tobler, C.; Visschers, V.H.M.; Siegrist, M. Addressing climate change: Determinants of consumers’ willingness to act and to support policy measures. *J. Environ. Psychol.* **2012**, *32*, 197–207. [[CrossRef](#)]
5. Salonen, A.; Siirila, J.; Valtonen, M. Sustainable living in Finland: Combating climate change in every day life. *Sustainability* **2018**, *10*, 104. [[CrossRef](#)]

6. Lorenzoni, I.; Leiserowitz, A.; de Franca Doria, M.; Poortinga, W.; Pidgeon, N.F. Cross-national comparisons of image associations with ‘global warming’ and ‘climate change’ among laypeople in the United States of America and Great Britain. *J. Risk Res.* **2006**, *9*, 265–281. [[CrossRef](#)]
7. Lee, T.M.; Markowitz, E.M.; Howe, P.D.; Ko, C.; Leiserowitz, A.A. Predictors of public climate change awareness and risk perception around the world. *Nat. Clim. Chang.* **2015**, *5*, 1014–1020. [[CrossRef](#)]
8. Kollmuss, A.; Agyeman, J. Mind the Gap: Why Do People Act Environmentally and What Are the Barriers to Pro-Environmental Behavior? *Environ. Educ. Res.* **2002**, *8*, 239–260. [[CrossRef](#)]
9. Verplanken, B.; Roy, D. Consumer habits and sustainable consumption. In *Handbook of Research on Sustainable Consumption*; Reisch, L., Thøgersen, J., Eds.; Edward Elgar: Cheltenham, UK, 2015; pp. 243–253.
10. Thaler, R.; Sunstein, C. *Nudge, Improving Decisions about Health, Wealth and Happiness*, 1st ed.; Yale University Press: New Haven, UK, 2008.
11. Beck, U. *The Risk Society*; Sage: London, UK, 1992.
12. Beck, U.; Giddens, A.; Lash, S. (Eds.) *Reflexive Modernization*; Polity Press: Cambridge, UK, 1994.
13. Latour, B. *We Have Never Been Modern*; Harvard University Press: Cambridge, MA, USA, 1993.
14. Urry, J. *Mobilities*; Polity Press: Cambridge, UK, 2007.
15. Bauman, Z. *Liquid Times: Living in an Age of Uncertainty*; Wiley & Sons: Hoboken, NJ, USA, 2013.
16. Douglas, M.; Wildavsky, A. *Risk and Culture: An Essay on the Selection of Technical and Environmental Dangers*; University of California Press: Berkeley, CA, USA, 1982.
17. Eurostat EU. Being Young in Europe Today—2015 Edition. Available online: <http://ec.europa.eu/eurostat/web/products-statistical-books/-/KS-05-14-031> (accessed on 20 March 2018).
18. Office for National Statistics. *Why Are More Young People Living with Their Parents*; Office for National Statistics: London, UK, 2016.
19. Armano, E.; Bove, A.; Murgia, A. *Mapping Precariousness, Labour Insecurity and Uncertain Livelihoods: Subjectivities and Resistance*; Routledge: Oxon, UK, 2017.
20. Di Fabio, A.; Maree, J.G. A psychological perspective on the future of work: Promoting sustainable projects and meaning-making through grounded reflexivity. *G. Ital. Ric. Appl.* **2016**, *9*. [[CrossRef](#)]
21. Gerbaudo, P. *The Mask and the Flag: Populism, Citizenism and Global Protest*; Hurst Publishers: London, UK, 2017.
22. Standing, G. *The Precariat—The New Dangerous Class*; Bloomsbury Academic Press: London, UK, 2011; ISBN 978-1849663519.
23. Boyd, D. Social Network Sites as Networked Publics: Affordances, Dynamics, and Implications. In *Networked Self: Identity, Community, and Culture on Social Network Sites*; Papacharissi, Z., Ed.; Routledge: Abingdon-on-Thames, UK, 2010; pp. 39–58.
24. Broadbent, S.; Gallotti, M. *Collective Intelligence: How Does It Emerge*; NESTA: London, UK, 2015.
25. Mulgan, G. *Big Mind: How Collective Intelligence Can Change Our World*; Princeton University Press: Princeton, NJ, USA, 2017.
26. Broadbent, S. *Intimacy at Work*; Routledge: Walnut Creek, CA, USA, 2015.
27. McMichael, M.; Shipworth, D. The value of social networks in the diffusion of energy-efficiency innovations in UK households. *Energy Policy* **2013**, *53*, 159–168. [[CrossRef](#)]
28. Botsman, R.; Rogers, R. *What’s Mine Is Yours: The Rise of Collaborative Consumption*; Harper Business: New York, NY, USA, 2010.
29. Godelnik, R. Millennials and the sharing economy: Lessons from a ‘buy nothing new, share everything month’ project. *Environ. Innov. Soc. Trans.* **2017**, *23*, 40–52. [[CrossRef](#)]
30. Schor, J. Debating the Sharing Economy. Great Transition Initiative. Available online: <http://www.greattransition.org/publication/debating-the-sharing-economy> (accessed on 20 March 2018).
31. Hyysalo, S.; Johnson, M.; Juntunen, J.K. The Diffusion of Consumer Innovation in Sustainable Energy Technologies. *J. Clean. Prod.* **2016**, *162*, S70–S82. [[CrossRef](#)]
32. Schot, J.; Kanger, L.; Verbong, G. The roles of users in shaping transitions to new energy systems. *Nat. Energy* **2016**, *1*, 16054. [[CrossRef](#)]
33. Welch, D.; Warde, A. Theories of Practice and Sustainable Consumption. In *Handbook of Research on Sustainable Consumption*; Reisch, L., Thøgersen, J., Eds.; Edward Elgar Publishing: Cheltenham, UK, 2015; pp. 84–100.

34. Di Fabio, A. The psychology of sustainability and sustainable development for well-being in organizations. *Front. Psychol.* **2017**, *8*, 1534. [CrossRef] [PubMed]
35. United Nations. Sustainable Development Goals. 2015. Available online: <http://www.un.org/sustainabledevelopment/sustainable-development-goals/> (accessed on 4 April 2018).
36. *ICT4S 2013: Proceedings of the First International Conference on Information and Communication Technologies for Sustainability, Zurich, Switzerland, 14–16 February 2013*; Hilty, L.M.; Aebischer, B.; Andersson, G.; Lohmann, W. (Eds.) ETH Zurich: Zurich, Switzerland, 2013.
37. Kotiranta, A.; Tahvanainen, A.; Adriaens, P.; Ritola, M. From Cleantech to Cleanweb—The Finnish Cleantech Space in Transition. ETLA Reports No 43. Available online: <http://pub.etla./ETLA-Raportit-Reports-43.pdf> (accessed on 25 March 2015).
38. Masero, S.; Townsend, J. *How British Companies Are Using the Web for Economic Growth & Environmental Impact*; NESTA Working Paper: A Market Scoping Study; Cleanweb: London, UK, 2014.
39. Baumgartner, S.; Quaas, M. What is sustainability economics? *Ecol. Econ.* **2010**, *69*, 445–450. [CrossRef]
40. Ornetzeder, M.; Rohracher, H. Of solar collectors, wind power, and car sharing: Comparing and understanding successful cases of grassroots innovations. *Glob. Environ. Chang.* **2013**, *5*, 856–867. [CrossRef]
41. Benkler, Y. *The Wealth of Networks: How Social Production Transforms Markets and Freedom*; Yale University Press: New Haven, CT, USA, 2006.
42. Paul, S.; Allen, N. Inventing the Cleanweb. MIT Technology Review, 2 April 2012. Available online: <https://www.technologyreview.com/s/427382/inventing-the-cleanweb/> (accessed on 4 April 2018).
43. Markard, J.; Raven, R.; Truffer, B. Sustainability transitions: An emerging field of research and its prospects. *Res. Policy* **2012**, *41*, 955–967. [CrossRef]
44. Smith, A.; Voss, J.-P.; Grin, J. Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. *Res. Policy* **2010**, *39*, 435–448. [CrossRef]
45. Rifkin, J. *The Zero Marginal Cost Society: The Internet of Things, the Collaborative Commons, and the Eclipse of Capitalism*; Palgrave Macmillan: New York, NY, USA, 2014.
46. Kenny, M.E.; Hage, S.M. The next frontier: Prevention as an instrument of social justice. *J. Prim. Prev.* **2009**, *30*, 1–10. [CrossRef] [PubMed]
47. Kelty, C. *Two Bits: The Cultural Significance of Free Software*; Duke University Press: Durham, NC, USA, 2008.
48. Transition2. Available online: <http://www.transitions2.net> (accessed on 19 March 2018).
49. Townsend, J.H. Digital Taxonomy for Sustainability ICT for Sustainability 2015. Southampton University. Available online: <https://eprints.soton.ac.uk/378266/> (accessed on 21 March 2018).
50. Kemp, R.; Loorbach, D.; Rotmans, J. Transition management as a model for managing processes of co-evolution towards sustainable development. *Int. J. Sustain. Dev. World Ecol.* **2007**, *14*, 78–91. [CrossRef]
51. STRN. A Research Agenda for the Sustainability Transitions Research Network 2017. Available online: [https://transitionsnetwork.org/about-strn/research\\_agenda/](https://transitionsnetwork.org/about-strn/research_agenda/) (accessed on 20 March 2018).
52. Spaargaren, G. The cultural dimension of sustainable consumption practices. In *Innovations in Sustainable Consumption*; Cohen, M.J., Brown, H.S., Vergragt, P.J., Eds.; Edward Elgar: Cheltenham, UK; Northampton, MA, USA, 2013; pp. 229–251.
53. Appadurai, A. *The Social Life of Things: Commodities in Cultural Perspectives*; Cambridge University Press: Cambridge, UK, 2011.
54. Miller, D. *Consumption and Its Consequences*; Polity Press: Cambridge, UK, 2012.
55. Gordon, E.; Baldwin-Philippi, J.; Balestra, M. Why We Engage How Theories of Human Behavior Contribute to Our Understanding of Civic Engagement in a Digital Era. In *The Social Science Research Network Electronic Paper Collection*; The Berkman Center for Internet & Society: Cambridge, MA, USA, 2013; Available online: <http://ssrn.com/abstract=2343762> (accessed on 20 March 2018).
56. Ritzer, G.; Jurgenson, N. Production, consumption, prosumption: The nature of capitalism in the age of the digital “prosumer”. *J. Consum. Cult.* **2010**, *10*, 13–36. [CrossRef]
57. Hargreaves, T.; Hielscher, S.; Seyfang, G.; Smith, A. Grassroots innovations in community energy: The role of intermediaries in niche development. *Glob. Environ. Chang.* **2013**, *23*, 868–880. [CrossRef]
58. Huijts, N.M.; Molin, E.J.; Steg, L. Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renew. Sustain. Energy Rev.* **2012**, *16*, 525–531. [CrossRef]

59. Sengers, F.; Wieczorek, A.J.; Raven, R. Experimenting for sustainability transitions: A systematic literature review. *Technol. Forecast. Soc. Chang.* **2016**. [[CrossRef](#)]
60. Feola, G.; Nunes, R. Success and failure of grassroots innovations for addressing climate change: The case of the Transition Movement. *Glob. Environ. Chang.* **2014**, *24*, 232–250. [[CrossRef](#)]



© 2018 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).