# The Future of Waste Innovation in 2030

# Introduction

Outcomes from the future planning scenario "The Future of Waste Innovation in 2030" are diverse, and represent a number of core drivers. We have condensed these drivers into Future Trends and explored how they affect the Future of Waste Innovation.

These core trends are best described as:

The On Demand Economy - Waste is significantly reduced through producing only in accordance with demand.

The Surplus Ecosystem - A parallel social system that treats waste (Surplus) as material resource and exchanges it's own Surplus (new/upcycled products) with society.

The Access Culture - An autonomous distributed network, working to provide everyone with access to knowledge, tools and resources they need to improve their lives and environment.

The world in 2030 is a diverse combination of legacy systems and products, and new systems, technologies and behaviors. In our descriptions and visioning we have focussed on the new Infrastructure Innovations, Archetypes, and Enabling Technologies relating to Waste Innovation, and Production (Waste Creation), considering how they engage with each other and Legacy Infrastructures, Archetypes and Products.

The following future scenario, is derived from several different innovation and discussion formats taking place in and around Open Design City, but primarily from the Micro Panel "Rubbish = Resource". An overview of these events can be found on the last page.

# Document Structure

For ease of reading and understanding, we have placed the Drivers at the start of this document. Each Trend is then described using the following structure:

### Infrastructure
What are the Infrastructure Innovations relating to the Future Trend?

### Archetypes
Personality Types engaged with the Future Trend?

### Enabling Technologies
What are technologies that Enable these Future Behaviors?

### Arguments
Why is this Future Trend attractive, how does it relate to the Future of Waste Innovation?

# Drivers

### Crowdsourcing/Crowdfunding/Crowd Creation

With small amounts of code, social networks, and free online tools, and a good story it is increasingly easy to build, fund, and demand new products, services, and innovations regardless of money, skill or resource.

### Changing Value System

Money is becoming less trusted and valued. People are beginning to question why they should have faith in money, and exploring other ways to broker trust and create value.

### Decentralisation of knowledge and process

Knowledge is increasingly distributed, with a little know how it is possible to find out how to do almost anything. Processes can be shared in simple formats, and positive storytelling can inspire new global patterns of behavior.

### Hyperconnection

The hyperconnected world of the internet, enables new opportunities for increased connectivity. Online Social Technologies and rediscovered offline behaviors are creating both virtual and offline spaces where communities can identify shared needs and act accordingly.

### Depleting resources

Depleting non renewable resources, will affect the cost of materials in the long term and create an economic market for alternative, previously unviable supplies.

### Open (Source) Culture

The Open Culture encourages and enables participation at all levels in an autonomous manner. These "share alike" behaviors, applying open source principles to systems, products, materials and processes, create an environment where anyone can participate in the improvement and augmentation of products, services and innovations.

This driver allows for and encourages the spread of the Fab Lab network at multiple levels.

It builds ecosystems and relationships at the core of it's culture and due to it's disruptive nature explores the margins and boundaries of the existing economic framework.

The Open Culture demands transparency and behaviors (Openness, and Access), this attitude combined with Create It Yourself behaviors (if we can't get it, we'll build it), makes for a powerful cultural driver.

The Open Culture encompasses a broad range of emerging trends (eg. Global Commons, Peer2Peer, Open Source, Open Design, Hacker Spaces, Fab Labs, Free Culture), behaviors and Archetypes.

Those engaging with the Open Culture are predominantly living on the margins of the present society, addressing the challenges faced by our existing system by exploring strategies of collaboration and cooperation, and testing alternative modes of exchange and value.

**Cradle to Cradle**

Cradle to Cradle's philosophy is an important driver, although within the above described model, these approaches are distributed in an Open manner, and therefore applied in the sense of Cradle to Cradle as philosophy rather than Cradle to Cradle as Brand. The behavior of the Material Experts is a response to this closed system of commercial collaboration which is not conducive to assisting with the spread of socially beneficial innovations.

**Upcycling**

In this context Upcycling is not just about material nutrient flows and not "downcycling material", but also about looking at material combinations in products and their structures. Seeking the lowest energy method of reintroducing material into the system. eg. a bike frame is best Upcycled into a bike frame, a broken chair into a chair.

# The On Demand Economy

Waste is significantly reduced through producing only in accordance with demand.

## Infrastructure

The four infrastructure innovations described represent complimentary aspects of the eco-system.

### Demand and Supply Markets

Demand and Supply Markets, allow for the aggregation of demand and the brokering of supply.

Demand and Supply Markets flip the existing system logic of Supply and Demand on it's head. Consumers aggregate around shared needs and desires, and Organisations and "Mayfly Businesses" bid to meet this need. As only what is needed is produced, waste through such markets is greatly reduced. "Pre-mediation" is frequently practiced, creating desire for products which don't yet exist, effectively manifesting future products and businesses through mediated storytelling.

*Example of a Demand and Supply Market in Action*

*A need is created for a washing machine which is easily repairable with locally printed components, and designed with components which are designed to last from materials that can be easily reentered into the system as usable material.*

*Individuals cluster around this need, adding to the brief, and stating what price they would pay.*

*Organisations bid what it would take to produce stating both quantities, pricing and team capabilities.*

*When number of individuals and the price they are willing to pay meets the production and pricing expectation of the producer a contract is made and production begins.*

*Washing Machines are delivered and funds are released, different financial packages and releases are also available to cover R and D costs, and initial expenditure.*

**Mayfly Businesses**

Mayfly Businesses, form to meet demands without the need to continue after products and services have been provided.

Mayfly Businesses are Organisations that form for limited lifespans, choosing Organisational Obsolescence over Product Obsolescence, Mayfly Businesses utilise the Demand and Supply Marketplace for identifying and brokering products and services, and for their own administrative infrastructures.

*An Example of a Mayfly Business*

*Market desire for washing machine is identified in the Demand and Supply Marketplace (see above example).*

*A Mayfly Business is formed by a Collaboration Specialist (see Archetypes).*

*The collaboration specialist identifies members in their network who can meet to service this demand.*

*They collaborate with Materials Experts, Material Spaces and Fab Labs, outsourcing some challenges to the broader community (creating their own demand in the marketplace).*

*A clear collaboration framework is proposed by the specialist to allow for creative problem solving, whilst at the same time ensuring interoperability of component parts.*

*Machine is produced, distributed.*

*Mayfly Business splits profits, and dissolves.*

**Passive Consumption Systems**

Passive Consumption Systems, provide consumers with their lifestyle needs without spending energy searching and buying (also allowing for efficient production and forecasting).

Passive Consumption Systems act as a lifestyle broker or enabler for Ultra Passive Consumers (see Archetypes). They provide regular consumables in accordance with moral, ethical and physical needs of the consumer, leaving the consumer free to focus on other aspects of their life.

Passive Consumption Systems have a very loyal following from Ultra Passive Consumers, and are able to forecast exactly what is required in advance, operating with incredible efficiencies and low waste.

**Autonomous Collaboration Frameworks**

Autonomous Collaboration Frameworks are used by Mayfly Businesses and Collaboration Specialists to manage on demand production.

These frameworks are sometimes merely working processes, where clear structures are established allowing all parties to function effectively, sometimes they are virtual software solutions and online tools. These are low management infrastructures, that allow for collaborating parties to work with maximum autonomy.

# Archetypes

The Archetypes described in the On Demand model exist in a symbiotic relationship, and represent different behaviors in the Demand and Supply Cycle.

**Collaboration Specialist**

Collaboration Specialists are incredibly well networked both in the "Legacy Culture" and the "Emergent Culture". They are able to create Autonomous Collaboration Frameworks, to meet the Demands created on the Demand and Supply Markets. They engage with the Scalable Fab Lab infrastructure mostly on larger scales as the opportunities and challenges are greater (Fab Labs being well equipped to handle simple jobs from local networks).

Ultra Passive Consumers represent ready made markets for Collaboration Specialists who compete to offer products of increasing social and decreasing monetary value.

Collaboration Specialists seek to provide long term benefits from short term input. Applying the "principles of personal obsolescence" (to make oneself unnecessary, whilst deriving income streams is the ultimate goal) to every project.

**Ultra passive consumers**

Ultra Passive Consumers ("Passives") have grown tired of information overload and social pressure to "do the right thing". Instead of opting out instead they "Opt in" to "Passive Consumption Systems". Their lifestyle choices are made for them, provided on an as needed basis, and in accordance with their ethical as well as material needs.

Ultra Passive Consumers subscribe to lifestyle as service, selecting different levels of sustainable consumption and adhering to it without loss of emotional energy. Passive Lifestyles are purely functional, but often also imbued with rituals and behaviors.

For convenience extreme "Passives" live in closed hyperlocal communities that provide for their every human need. Their whole lives are managed and curated by other Archetypes.

At the extreme end of the Passive Spectrum we find the....

**Sleepers**

Sleepers, are Fundamentalist "Passives", reducing their consumption by choosing only to live when socially and environmentally convenient. They spend the remainder of their time in hibernation. Such behavior is subsidised by the state or corporations to offset carbon emissions. Many members of society often temporarily opt in for hibernation to reduce cost of living as well as global impact.

## Enabling Technologies

On Demand Technologies focus on Passive Purchasing, and Demand Creation. They seek to exploit the link between Demand and Supply.

### Mobile Alternatives

By taking a picture of a product or scanning receipts consumers can request alternatives that fit with their ethical as well as physical needs. Products are then sought and provided on their behalf.

### Serendipity Engine

A serendipity engine is a mobile application - it knows what you are looking for based upon your profile and expressed needs, when you pass someone who can provide those needs, it alerts you to their presence and what they can do for you.

The serendipity engine is used for social interactions, as well as to obtain products an services on a daily basis.

# Arguments

Waste is significantly reduced through producing only in accordance with demand.

The On Demand Economy represents an important shift in our relationship with Waste, and Consumption. These two cycles are intrinsically linked. By ensuring that only what is needed is produced, Waste is greatly reduced. The On Demand Economy also allows consumers to demand Innovative solutions to product waste as a point of desire (creating markets for innovative waste products).

The Mayfly Businesses and the Demand and Supply Systems they use to identify market demand, are an important response to the overall need to reduce waste, as waste itself creates more work (a waste of time) for society (not to forget all the environmental arguments).

Systems with a limited life span, and planned labour obsolescence have the potent capacity to reduce our overall need to work, and our need for resources.

One danger with Mayfly Businesses is that of post production responsibility and insurance, however in a world of increased transparency (provided by the Access Culture, will ensure that responsibility is taken, or reputation will be destroyed).They allow for society to advance itself, and in a direction where surplus (ie. waste) is almost eradicated. The only Surplus society should have is time (an excess of which creates entirely new market opportunities).

The expression and aggregation of consumer desire allows us to create whatever reality we choose. This raises important questions about what our actual desires are.

For a better future to manifest itself, it must become easier to create positive social impact than it is to be globally destructive. Ultra Passive Consumers are an effective means of creating socially driven market places which create demand for sustainable solutions.

Collaboration Specialists and Ultra Passive Consumers represent two extremes of engagement within the On Demand Economy

The On Demand Economy creates the opportunity for social, environmental and economic innovation, without the creation of excess (Waste). It allows for people to meet their desires without sacrificing their lifestyle needs.

# The Surplus Ecosystem

## Infrastructure

### Waste Mines

As non renewable resources are depleted and become more costly to obtain, old landfill sites and former dumping grounds become more economically tenable. The "Rubbish Rush" occurs in formerly dumped upon developing nations, as entrepreneurs race to cash in on new commercial opportunities, using distributed technologies developed by the Material Experts (see Archetypes).

### Material Labs

In Material Labs, Material Experts (AKA Material Mavens) combine and separate organic and synthetic materials to create products which can be more easily disassembled through composting. Material Labs store and extract resources from both new waste (that created using Cradle to Cradle thinking) and old waste (continuously experimenting with new methods of extraction and disassembly). Material Labs often can be found close to Fab Labs in relevant scales, providing complimentary services.

*Note: The Surplus Ecosystem also relies heavily on the Access Culture Infrastructure (see below)*

## Archetypes

### Surplus Sufficients

The Surplus Sufficient views Waste as Surplus - just a resource that there is too much of that needs reallocation and re-evaluation. The Surplus Sufficients focus on different aspects of Surplus, they see opportunities in the excess, and have strategies of coexistence that allow them to enjoy a positive lifestyle. Core providers at the center of the Surplus Sufficient ecosystem are:

*Hunter Gatherers - establishing deals with supermarkets, restaurants, bakeries, farmers and food markets. Surplus Sufficients guarantee that food waste will be used to support other Surplus Sufficients and those engaged in activities geared towards a sustainable society.*

*Space Invaders - Establishing relationships with property developers and landlords, Surplus Sufficients, establish themselves in local spaces that contribute to gentrification of space and the greater community, increasing value for the landlord and gaining access to the spaces they need to live and work.*

Surplus Sufficients engage with every aspect of waste in society, using Fab Labs to fix, repair and Upcycle waste products into valuable tools, and Sharing Spaces for Cocooking,

resource and knowledge exchange. They are even able to meet their entertainment needs from Surplus seats at events.

Surplus Sufficients collaborate with Material Experts, providing the Experts with resources supplies and infrastructure, in return for usable materials and knowledge.

It is possible for Surplus Sufficients to sustain themselves within their local networks. However they are also highly valued by Industries and Businesses looking to improve their own resource management, as their knowledge base, networks and behaviors make them well equipped to identify new opportunities (early projects included linking Crematoriums and Gymnasiums to their private energy grid).

They share incomes generated with their community, making this Surplus available to whomever needs it when venturing outside of the community or networked spaces (visits to friends and relatives, holidays).

### The Accessionists

A specific type of Surplus Sufficient, Accessionists don't own anything, they share it. They loan or borrow whatever they need as and when they need it.

### System Upcyclers

System Upcyclers are Surplus Sufficients operating on the Macro Level, identifying "Surplus Organisations" (those which add no social value, or organisations that possess components and infrastructures which could be put to more effective use).

System Upcyclers, crowd source funds to facilitate "loving take over bids" buying up shares in public firms for a pre-expressed purpose. System Upcyclers are clever system manipulators, consciously driving down share prices prior to and during a buy out (as traditional shareholders are terrified by their non profit rhetoric).

Some companies employ System Upcyclers, recognising the values that their behaviour's bring. However they are greatly feared.

System Upcyclers make good use of the Demand and Supply Markets to broker community needs against corporate resource.

## Enabling Technologies

Surplus Ecosystem Technologies focus on Disassembly, Upcycling and Product Extension

### Waste Tracking

RFID chips in all products as well as providing the Access Culture with the ability to augment products, provide the Surplus Ecosystem with the opportunity to locate material and resource clusters.

**Permatape**

Permatape is a fabric tape which hardens when in contact with the air. When wrapped around any two objects it binds them tight together and can create a multitude of structures with ease. Permatape can be treated with an organic solvent that temporarily returns it to it's fabric state.

**Perforated Circuit Boards**

For ease of dangerous materials separation.

**Modular Products**

Highly specialised yet interfacing products which can be combined "lego style" to meet specific functional needs.

**Compostable Electronics**

A combination of organic and synthetic product, the products are designed to be disassembled by composting, or digestion by micro-organisms, outputs are energy, usable fertiliser, extractable synthetic materials and reusable components.

**Module/Component exchanges**

Both localised and virtual spaces. Local exchanges can be found at the material labs, virtual spaces allow for "home composting" and object swapping.

## Arguments

A parallel social system that treats waste (Surplus) as material resource and exchanges it's own Surplus (new/upcycled products) with society

The Surplus Sufficients are key Archetypes for a complementary ecosystem, a countercultural framework to a society who's main output is Waste.

Encouraging such systems to grow and thrive is essential to create an Innovative Waste Environment, where wealth and growth can be created from waste, whilst at the same time putting valuable material flows back into society.

Complementary ecosystems such as this are necessary to evolve and grow infra structural solutions to Waste Innovation. Centralised and managed systems cannot meet the challenges (there is not even the knowledge required, it must be discovered).

This key behavior represents a way to which Cradle to Cradle ecosystems can be built from both directions.

Such a system would ultimately harmonise and combine with the present system. However to begin with there must exist the legal, knowledge and physical frameworks to encourage such behavior on a large scale.

# The Access Culture

## Infrastructure

Infrastructure Innovations are scalable in their nature operating in a "fractal" manner (ie. the behaviors and systems essentially look the same regardless of scale). This makes it easier for behaviors and roles to be applied at different levels of the system, whether they are operating at macro or hyperlocal (aka micro) scales.  The infrastructure innovations represent enable a parallel ecosystem to evolve alongside the "Old Economy".

### Scalable Fab Lab Network

Fab Labs operate at both hyperlocal, community, and global scales. "Fab Factories" are fluid and transient spaces producing and modifying their own tools for mass production as needed in accordance with the Demands created and communicated by the Demand and Supply Markets. Scale of production is dependent on scales of demand, efficiencies and personal choice. Local Labs, Factories, and Home Labs all provide different levels of commercial and social engagement.

### Sharing Spaces

Sharing Spaces provide communities and future Archetypes with physical spaces for sharing, knowledge, skills and resources. Both Material Labs and Fab Labs are sharing spaces, however more general spaces are also a critical part of the social infrastructure, providing the community with opportunities to experiment and service it's own needs.

Alongside this environment new trends, behaviors, personality types and technologies have evolved. Below are descriptions of specific Archetypes and the technologies they engage with.

## Archetypes

### Material Experts

Material Experts possess a wide range of skill sets and collective behaviors, from Social Hacking ("Asif-ism" - behaving "as if" they are an expert in a particular field in order to gain access to knowledge), to reverse engineering of materials, gardening, biology and chemistry.

They are devoted to the understanding, creation and reclamation of material. They are regarded by some as antisocial and obsessive. However they are much respected as they share everything they know with the world.

They are often also Ultra Passive Consumers, as they would rather devote their time to research and development.

Material Experts are much sought after for their expertise in Disassembly, as well as for their material supplies and knowledge.

# Enabling Technologies

Access Culture Tools are primarily focused on Legibility, with production needs and capabilities being provided by the Material Labs and Fab Labs (previously described).

### QR Code Circuits

QR Code Circuits are circuit boards which are printed in the form of a QR code (a scannable barcode), which can be read by mobile devices allowing for ease of understanding what a circuit contains and what it does.

### Augmented Products

Products are Augmented by RF chips and other technologies allowing for contained materials to be identified, processes and production flows to be comprehended, as well as instant access to a wiki showing every potential use of a product in it's afterlife.

The materials and product wiki is created in some cases by companies, but more often than not by activists.

Wiki's are also used to add value to products by documenting their history and experience.

# Arguments

An autonomous distributed network, working to provide everyone with access to knowledge, tools and resources they need to improve their lives and environment.

The Material Experts belief - that everything should be accessible and Open to all - allows for a cultural transition into a society where everyone can help to innovate and improve.

Points of control and absence of information are bottlenecks preventing innovation and advancement where it is most needed.

The spaces at the core of the Access Culture - Fab Labs, Sharing Spaces, and Material Labs create definable focal points for the Access Culture to engage with the world.

Our conventional system of control, and hierarchy has simply grown to big to manage, and yet is perceived as too big to fail.

The Access Culture, provides the world with an alternative means to engagement. It encourages participation and co creation. Which leads to a greater connection and understanding in all aspects of life.

It removes all barriers to innovation with the exception of perceived financial reward. However these issues are covered by the On Demand Economy (as deals are made in advance and at a preset value).

The Access Culture creates the opportunity for everybody to improve the world.

# Barriers

### Legacy Control Systems and Mindsets

The change brought about by the systems described above will be disruptive to many existing systems and infrastructures. Entire industries will need to adapt, die, or fragment.

The natural response will be to attempt to prevent the new systems from emerging using the law and pressure groups - see below. Many will struggle to relinquish control over their knowledge, their information, their markets and their image.

### Legislative bodies and legal hurdles

Legislation, both existing and new, brought about by protectionist mindsets, functioning only to support aging industries, presents a hurdle to the future created above. At least where Archetypes obey the law.

However in order to prevent the outlawing of socially beneficial environments and Archetypes, the creation of "Temporary Autonomous Zones", would allow for alternative systems to flourish. This would provide for the necessary experimentation with behavior and technology required to address the problems of the existing system.

### Complexity

The complexity of the existing systems of production and material flows are a great barrier to widescale adoption/manifestation of this vision. Initially the vision would be applied to simpler systems, growing in complexity as more resources and visibility increase.

### Accessibility

The success of this vision, depends upon access to knowledge and information. An increased visibility of process and supply chain. Whilst the Material Experts may be specialised in Opening up organisations, Access is also about the knowledge required to interpret the information provided. Whilst some of the Enabling Technologies facilitate this, unless the technology is available to all it will still present a barrier to understanding.

### Legibility

Complicated information must somehow be distilled into a legible format that can be read and understood by the general public. Numerous forms of Literacy are required in order to read objects. The most basic of these is Physical Literacy (understanding how to manipulate, read and re-write physical objects).

# Conclusion

This future scenario addresses the challenges and opportunities of Waste through a re-framing of how Waste is perceived and how it is created.

Visibility and understanding of process are best achieved on a local scale, as the community is better connected to what it consumes and the waste it produces (Plus there are also the efficiencies regarding transportation and logistics).

Consumers, Amateurs, Entrepreneurs and Enthusiasts will drive Waste Innovation and global transformation as they first familiarise themselves with existing tools and opportunities, and then build their own.

Access to knowledge, tools and resources is a Human Right, by distributing these powers we give everyone the opportunity to innovate.

Considering what our Culture desires before we create will reduce our waste, whilst at the same time increasing our access to what we truly desire.

Finally Complimentary Ecosystems, not managed transition hold the key to accelerated innovation, and balancing our waste output against our consumption needs.

# Process

"Rubbish = Resource", an open discussion around Waste Innovation, and future scenarios. This Mini Panel brought together a diverse range of people with different mindsets and skill sets to explore the key themes and drivers around waste innovation. The outputs from this workshop comprise the core of this document.

The following persons participated in this workshop: Pedro Pineda, Ruta Vimba, Susanne Stauch, Christophe Valliant, Dominik Wind, Greg Poulton, Viktoria Trosien, Jurgen Breiter, Jordana Maisie, Mendel Heit, Judith Meijer, Andrea Lospenato

The Workshop was facilitated by Jay Cousins and Christopher Doering

"House of the Future", an Enable Berlin Event within Open Design City, using design thinking processes to create innovative future products in direct response to a brief to design a Sustainable house of the future, incorporating multiple needs in 40 sqm of space. This sparked ideas and dialogue around Waste Innovation within the home (small C2C ecosystems), and the future of space.

"Upcycle it - Upcycling Furniture edition". Upcycling in this context and the context of this document is more from a grassroots perspective. An account of this definition is given in the drivers section. This event was the chance to observe directly action processes and behaviors which are also influential in this future vision. Again it also sparked further dialogue and reflection in the community.

The community interacting and engaging with the Open Design City is one which in it's nature is highly future orientated. Due to this, other discussions and actions also have influence in this vision including, the Future of Money, Innovation Processes, the Free Culture, Open Design Practices, Cradle to Cradle vs UpCycling, and the New Sharing Economy.

The above vision therefore has roots in a range of discussions, some focussed and some from overlapping themes. We have then distilled this into some key trends, drivers and ideas portrayed through a vision of the world in 2030.