

Technological Change and Innovation
BMSP5001

Assessment 2

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REPORT CONCERNING INNOVATION PROPOSITION FOR SUSTAINABLE BUSINESS IDEA IN CARMARTHENSHIRE

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Abstract

The purpose of this report is to create an innovation plan for a sustainable business idea in Carmarthenshire. The UN Environment Program reports 79% of plastic waste has been sent to landfill or the environment. (UNEP, 2018) Landfills are not only harmful for the environment but also to humans, with studies confirming increased frequency of a variety of ailments and a higher risk of birth defects. The decline of the landfill looks to be drawn out as a result of corporate mismanagement of waste and the difficulty in recycling certain plastics. Almost a million tonnes of furniture are sent to landfill yearly despite much of which being recyclable. (Edie, 2015)

The premise of this idea is to spark a revolution in recycling by creating the first in-house recycled chair. Because of the financial constraints of a startup and the unforgivingly competitive nature of the furniture industry, it is decided that chairs will be sold on contract to council institutions until funds can be raised for a public launch. A variety of machines are needed for the recycling process and the final upfront cost is expected to be £40,000. Expertise required for this project are in the fields of sustainable disposal, ergonomics and marketing.

Introduction

This report concerns the proposition of an innovation plan for a sustainable business idea in the Carmarthenshire region. The industry in question is the furniture industry, specifically the production of chairs in an industry where, all too often, they are destined to go to landfill.

The concept of the circular economy must be explained to ensure that the implications and benefits of the idea are properly grasped. For generations, the world's 'lingua franca' economic model has been linear; called the 'take, make, throw away' economy, this method of going about consuming and producing has been incredibly wasteful and, in many cases, harmful for the planet. (Monasse, 2021) Imagine a straight line with the three processes listed above labelled on it. It doesn't repeat, so more and more resources will be taken, which begs the question - what are the implications of this on the world, and what happens when we run out of resources to dig up? Now, imagine a circle and observe how it repeats infinitely; if this process could be applied to our current economic model, imagine the outcomes it would create for our world, our societies and countless other facets of life that we may neglect to think about on a day-to-day basis. This is what the primary principle of a circular economy is: designing out waste, even going so far as to eliminate it altogether. (Youmatter, 2020)

In order to gauge the effectiveness of a sustainable business solution, its purported benefits should be compared with those that a circular economy offers. These include primarily, but are not limited to; fewer greenhouse gas emissions, by reducing material inputs and production processes; fewer negative environmental impacts such as pollution of soil, water and air; more resources saved through maximisation of material life cycles and minimisation of landfill use; and, lastly, creation of demand and employment for new services, such as refurbishment or repurposing of end-of-life products. (Youmatter, 2020)

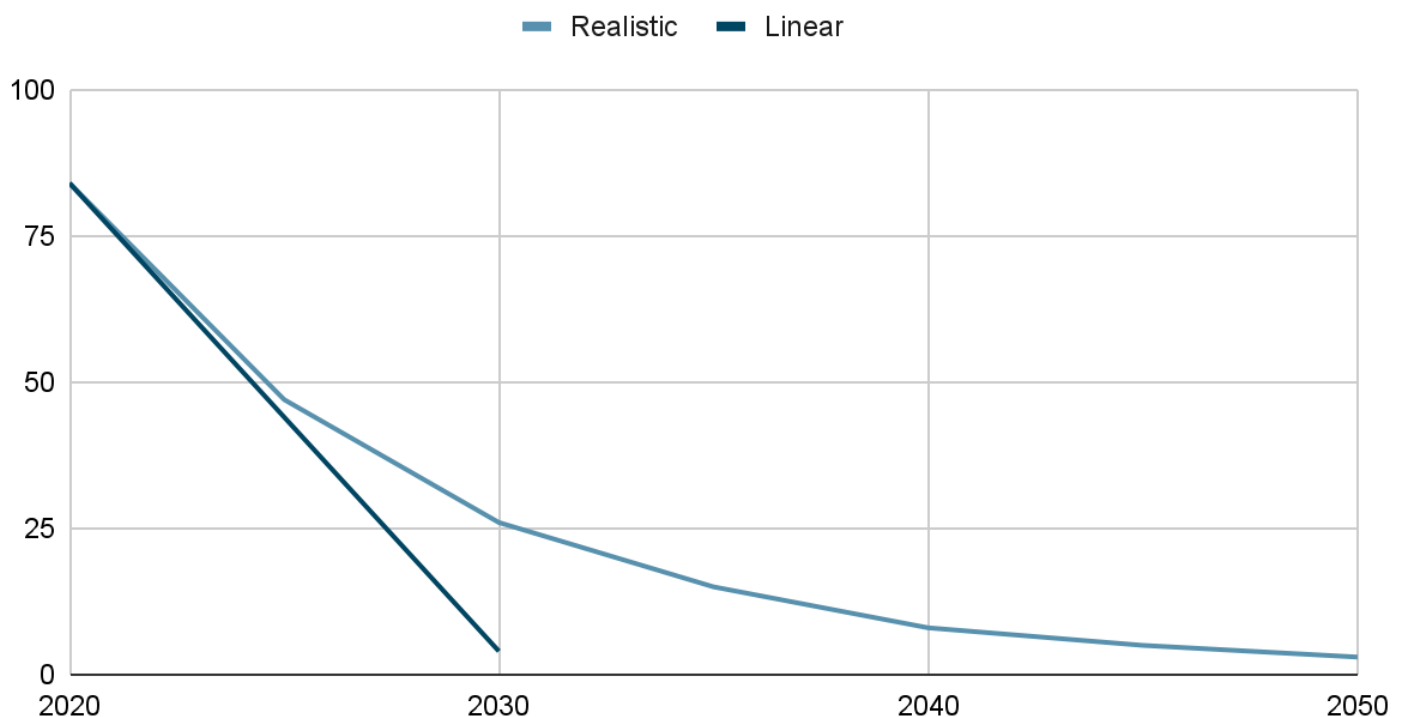
For clearer goals to aim for, the above may be reduced to aiming for three outcomes: closed cycles, renewable energy and systems thinking (recognising that each agent in the economy is interconnected). (Kenniskaaarten, 2015)

Inadequacies to be addressed

A particularly pertinent figure to keep in mind for this section is the amount of municipal waste sent to landfill in 2019 - 6.6 million tonnes, down from 7.2 million tonnes in 2018. (Department for Environment, Food and Rural Affairs, 2021) This difference of 0.6 million tonnes in a year will take a while to bring about an end to landfill use altogether if this yearly change is assumed to be regular. Assuming that a reduction of 0.6 tonnes per year is to be expected, it will take 11 years for landfill usage to end. It is important to face reality head-on, and reality dictates that this expectation of an unchanging yearly reduction is naive at best.

The UN Environment Programme (UNEP) reports that 79% of all plastic waste has been relegated either to the landfill or the external environment; much of this comprises the single use plastics: polyethylenes, polypropylenes and polystyrenes. (UNEP, 2018) If current trends continue, the amount of plastic in the world's oceans is forecasted to exceed the amount of marine life in them by 2050. Many of the world's top producers continue to neglect due care in waste management. As the easier-to-recycle waste is phased out of landfill use, what remains will be the waste that cannot so easily be recycled, or that which manufacturers do not take proper care in the disposal of. Consequently, the decline of the landfill is not likely to be linear, so much as exponentially smaller over time, as demonstrated by the graph below.

Demonstrative Example: Landfill use, as % of 2018 fig.



To get to the root of the issue and understand the reasoning behind this innovation plan, it is necessary to understand why landfills are so commonly regarded as harmful. The University of Colorado Boulder (Vasarhelyi, 2021) reported that this method of waste disposal comes with many pressing environmental effects, the most dire of which being its release of methane gas, which is 84 times more effective than CO₂ at absorbing the sun's rays. Furthermore, leachate is a common liquid byproduct of landfill sites; it commonly contains ammonia or mercury which can have serious ramifications for local ecosystems, often resulting in dire results

such as ‘dead zones’ in local water sources. The same university also states that landfills come with serious social effects such as health ramifications for those living and working in the vicinity, with a study reporting that children of families living within a mile of a landfill faced a 12% higher risk of birth defects. A different study, which took place in South Africa, concluded that 78% of participants living within 100-500m of the landfill site showed serious air quality contamination. Also frequently reported were ailments such as flu, irritation of the eyes and bodily weakness; 56% of participants were noted to have feared for their health in the future and many stated that they were less satisfied with the location of their communities with respect to the landfill site. (Njoku et al., 2019) Apply this knowledge to the UK - the website Anyjunk states that the nation has over 500 landfills and that over 23% of our waste goes to these sites. (Anyjunk, 2020)

A final point to make on the topic of waste disposal is that 1.6 million tonnes of bulky waste - waste too large for normal household disposal, of which 42% is furniture - is sent to landfill every year, according to Edie. (2015) This isn't a necessary option for bulky waste, either; over half of this waste is recyclable, which could mean that communities may very much stand to benefit from a circular economy-type system. This issue is the main problem that this innovation plan has been designed to tackle: non-recycled furniture waste.



Image credit: Shepard, S. E. (2020). *Furniture dump* [Image].
<https://www.saraheshephard.com/are-you-sitting-comfortably/>

Scope of the solution

The basic premise of this sustainable business idea is to create a set of plastic chairs, sold to government-funded institutions such as schools and hospitals, able to be recycled into new iterations of themselves. The difference between this product idea and many other recyclable products is that forethought is given to end-of-life treatment. Many typical manufacturers wash their hands of responsibility for proper disposal once the product changes hands - here, responsibility for end-of-life disposal of the chair remains.

“Why not broaden the scope of this idea to encompass the general public instead of limiting it to the public sector?” This will be answered in detail using a two-pronged approach.

Firstly, the capital available to us will be severely limited during the first few years of operation. Launching headfirst into the public sector would mean direct competition with the world’s leading, and most competitive, furniture companies - IKEA, Dunelm, DFS, John Lewis and Next, to name a few. These companies are at the cutting edge of research and development, with IKEA having their own circular economy furniture reselling service. (IKEA, 2021) These companies would prove to be insurmountable competition should we enter into their markets; they have left their own permanent mark on them and have a solid reputation with consumers, neither of which we can claim to have. In contrast, selling to public sector firms through local councils gives us much more opportunity for growth - both by taking advantage of financial incentives such as the government’s Sustainable Production grants (Welsh Government, 2015) and being able to end up on a shortlist for suppliers to schools, hospitals, clinics and so forth, ensuring adequate access to customers.

Secondly, as a small business, it is important that we tailor our product offering to a niche set of customers. A small, independent firm cannot afford the design and research costs associated with making a large product portfolio. Furthermore, the time and effort from a small team which would be needed for such a large portfolio would likely result in lower quality for the consumer and a lower rate of customer loyalty - one foot in the grave. Being on a furniture shortlist for government-owned institutions would allow us to tailor our product offering to their needs specifically. This can be negotiated with the council, likely resulting in a request for a particular specification of product. With this information, the team can devote their time, effort and funds wisely in order to ensure the best quality sustainable chairs are produced, meaning there would be a much higher chance of repeat custom. Once contracts are secured, ample ROIs are made, and the startup is able to get itself into a position where funds can be saved for R&D into a public launch, this could be considered. For now, however, it is safest considering these points that we limit our scope to the council.

Processes involved and approximate costing

Plastic recycling in itself is not a new phenomenon and there is a wealth of online information pertaining to the processes that will be required. For this report, the sources referred to for the plastics recycling process will be British Plastics Federation (2021), RTS (2020) and Plasgran Ltd (2015). All of these sources have a background in plastics management and disposal - BPF acts as a hub of plastics information, RTS concerns itself with diverting waste from landfill and Plasgrain is itself a plastic recycling specialist.

The starting point is the collection and sorting of plastic to be recycled. BPF notes that plastic must be separated from other materials in a mixed recycling bag, using techniques including; manual picking, throwing away any non-disposables or contaminated items; trommels, which are cylindrical drums with holes causing a sieving process for finer materials; magnet and eddy currents to separate ferrous and non-ferrous metals from other recyclables, respectively; and optic sorting machines, utilising Near Infrared measurements to identify plastics through light absorption rates. Plasgrain notes that the most commonly recycled plastics are polyethylene terephthalate, high-density polyethylene, polypropylene and polyvinyl chloride.

The second and third stages are washing and shredding, respectively. According to BPF, the washing process helps in the removal of adhesives, labels and residues to ensure that the plastic is as clean as possible; it involves a variety of methods, ranging from friction washers utilising heat, movement and pressure, to rotary washers utilising a caustic solution heated to remove oils and foodstuffs. The processes of shredding and extrusion convert these plastics into flakes and then small pellets after being melted down; examples of shredding machinery include hammer mills to pulverise plastics in a rotary drum and bear shredders using guillotines and rotary cutters. Plasgran and BPF both sell plastic pellets to manufacturers at this stage.

BPF notes how these recycled pellets are transformed back into a usable product: the pellets are poured into a reactor and heated to a sufficient temperature for casting as a molten liquid into a mould. (Baheti, 2015) After this, any required assembly of plastic components occurs and the recycled product is ready.

Plasgran's methodology includes more details as to the nature of each process. After resizing, the shreds that leave the process undergo wet and dry separation - the first of which utilising float tanks to separate pieces by density in addition to washers and water tanks to remove any contaminants, and the second differentiates any remaining unfiltered plastic by either thickness, melting point or colour by using UV light. The final stage is compounding, wherein plastics are transformed into high-quality and reusable pellets using a compound line. Because of Plasgran's level of detail regarding these processes and their status as a plastics recycling specialist - meaning it engages in something that this business must too - this company is the source of choice for obtaining plastics recycling information. The following pictures are of Plasgran's cutting-edge recycling technology.



The end product to be expected after plastics leave the recycling process.

Image credit: Plasgrind. (2015). *Plasgran plastic recycling pellets 2* [Image].

<https://plasgranltd.co.uk/wp-content/uploads/2015/10/Plasgran-plastic-recycling-pellets-2.jpg>



Resizing technology used in the shredding process.

Image credit: Plasgrind. (2015). *Plasgran plastic recycling size reduction* [Image].

<https://plasgranltd.co.uk/wp-content/uploads/2015/10/Plasgran-plastic-recycling-size-reduction.jpg>



Sink-float technology, used as part of the wet separation process.

Image credit: Plasgrind. (2015). *Plasgran plastic recycling sink float technology* [Image].

<https://plasgranltd.co.uk/wp-content/uploads/2015/10/Plasgran-plastic-recycling-sink-float-technology1.jpg>



Optical colour sorting machines, utilising ultraviolet light to sort plastics by colour.

Image credit: Plasgrind. (2015). *Plasgran plastic recycling SEA optical colour sorter* [Image].

<https://plasgranltd.co.uk/wp-content/uploads/2015/10/Plasgran-plastic-recycling-SEA-optical-colour-sorter.jpg>



An extrusion machine, responsible for the final phase of the recycling process.
 Image credit: Plasgrind. (2015). *Plasgran plastic recycling compounding equipment* [Image].
<https://plasgranltd.co.uk/wp-content/uploads/2015/10/Plasgran-plastic-recycling-compounding-equipment.jpg>

Seeing as this business idea revolves around the sustainable recycling of plastics, acquiring this machinery is critical as a first step before any other process goes online - if the chairs cannot be recycled, then the point of this entire venture is defeated. It is also important to work out the amount of capital needed to purchase this machinery, as this will put this entire project into perspective and give the project management a better idea of the funds that need to be raised before any trading can begin. Alibaba is an excellent first port of call as a business-to-business e-commerce marketplace for obtaining an understanding of the costs involved with the purchase of industrial assets. Listed below are some of the site’s recommendations in regards to the above machinery:

Sink-float technology:

PET flakes,PP, label, sinked& floating plastic separator &separating tank plant

Steady Order Pricing

FOB Reference Price: [Get Latest Price](#)

£757.91 - £3,789.52 / Set | 1 Set/Sets(Min. Order)

Model Number: YMWM-5000JH

Shipping: Support Sea freight

1 Year for machinery warranty

[Alibaba.com Freight](#) | [Compare Rates](#) | [Learn more](#)

plastic pe pp pet sink float separator washer washing tank with price

CE [View More](#)

Steady Order Pricing

1 - 1 Sets	>=2 Sets
£8,033.79	£7,427.46

Benefits US \$3,000 Coupons [Apply Now >](#)

Model Number: 300- 1000kg pe pp film pet flake floating washer

Lead TimeⓈ:

Quantity(Sets)	1 - 1	>1
Est. Time(days)	10	To be negotiated

[View larger image](#)

The second separator is of a more appropriate size for the scope of this business venture so the higher cost at £8,000 is to be expected for this machine.

Shredding machinery:



Ready to Ship In Stock Fast Dispatch

High quality waste shredder/plastic scrap metal crusher machine prices

£2,273.72 / Set | 20 Set/Sets(Min. Order)

Customization: Customized logo (Min.Order: 1 Pieces) Customized packaging (Min.Order: 1 Pieces) More

Source now



CE Marked Scrap Metal / Plastic/ Fiber/Tyre Double Shaft Shredder

CE View More

>=1 Sets

£6,063.24

Benefits

Pro US \$3,000 Coupons Apply Now >

Model Number:

HNST600

Samples:

HNST600

£8,185.37/Set | 1 Set (Min. Order) | Buy Samples

Lead Time:

Quantity(Sets)	1 - 1	2 - 3	>3
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The latter item, although much more expensive, comes at a size much more suitable to our scale of operations as a supplier to the public sector. £6,000 can hence be earmarked as the expected cost for this apparatus.

Extrusion machine:



Plastic extruder machinery suppliers PVC/ABS/PP/PS/PC plastic extrusion machine

FOB Reference Price: Get Latest Price

£1,515.81 - £4,547.43 / Set | 1 Set/Sets(Min. Order)

Benefits

Pro US \$3,000 Coupons Apply Now >

Shipping: Support Sea freight

Alibaba.com Freight Compare Rates Learn more

Protection: Trade Assurance protection your alibaba.com order Refund Policy

Customized Speed Double Color Automatic LED Strip PVC Extrusion Machine for Plastic Processing

Steady Order Pricing

★★★★★ 5.0 1 Reviews 1 buyer

>=1 Sets

£28,800.36

Model Number:

XHL01

Output (kg/h):

Other

Lead Time:

Quantity(Sets)	1 - 1	>1
Est. Time(days)	30	To be negotiated

Here, the second machine is of a more reasonable size for industrial application. The £28,000 figure, when comparing this to other models of similar sizes, is roughly an average for this type of machine, although some larger models come in at a much higher price.

The *upfront* cost of these machines is in the £40,000 range, not including the purchase of a facility in addition to hiring costs. Many of these machines are autonomous but require a person present to ensure smooth operation and perform routine maintenance, meaning that there will be an additional variable cost in employee

wages. Given this, it is highly likely that the venture will make a net loss for the first few years of its operation. What is important for its survival during this phase is investors' funds; if these have been secured then this will 'carry' the business through its initial hardship.

Expertise required and where to get it

There are three areas for which we should aim to bring expertise on board. These are: sustainable disposal, ergonomics and marketing.

Regarding sustainable disposal, an unfortunate side effect of recycling plastic is that it becomes weaker with each new iteration (Residential Waste Systems, 2018); this can only be solved with reinforcement or mixing in new plastic for a certain amount of times before it becomes unprofitable. At this point, thought must be given to how this plastic can be safely and sustainably disposed of, which is where this expertise will come in handy. An advisor with a scientific background in sustainable operations would be able to provide proper directions and knowhow for the disposal of unusable plastic.

Ergonomics is also important to consider for a sustainable chair - after all, it is still a *chair*. Even though our USP is sustainability-based, comfort is wrong to ignore here and would only result in going out of business if nobody enjoyed them. Consulting a professional ergonomist in the design process for each model will ensure that key elements are not overlooked and that focusing on sustainability does not compromise 'sit-ability'.

Lastly, marketing is a very large discipline, so this can be narrowed down to social media for brevity. Today, image is everything; proper behaviour online can boost a business' engagement metrics, while poor social media management can tarnish an image irreparably. Companies - especially firms on council payroll buying from a shortlist - would be quick to ignore an un reputable option. We cannot afford to be the un reputable option. An experienced PR manager knows the right ways to engage with users to generate positive engagement and to quell any fears in times of uncertainty or controversy.

Conclusion

The topics discussed in this report were the argument for the existence of a sustainable recycled chair, both as a way to kickstart the recycling of chairs in a primarily landfill-destined industry and to help bring other disposal solutions to the mainstream to usher in a circular economy; the machinery required to make this vision a reality and the feasibility of acquiring these technologies with investors' funds; and finally the expertise needed for this project and where it can be obtained.

Key findings from this report are that 1.6 million tonnes of bulky waste is sent to landfill yearly - a number that this venture wishes to reduce through publicity of its recycling process. Landfills have a catastrophic effect on those living and working nearby, as well as local communities, which gives this project all the more justification. The machinery needed to realise this vision costs roughly £40,000 upfront, before the cost of a facility and any related to personnel - significant investment will be needed to be able to go ahead with this plan. Necessary sources of expertise for this project includes professionals in the areas of sustainable plastics disposals, ergonomics and public relations; given this decade's hyper-focus on sustainability, finding someone talented in the field should be relatively easy, and the same can be said about PR management. One thing to consider is that sourcing expertise may add to our costs due to consultation fees and salaries but this invaluable knowledge is well worth the price. Overall, this project shows signs of being incredibly promising as it has a sound justification, backing and support.

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