Waste Topic Paper H

Anaerobic digestion

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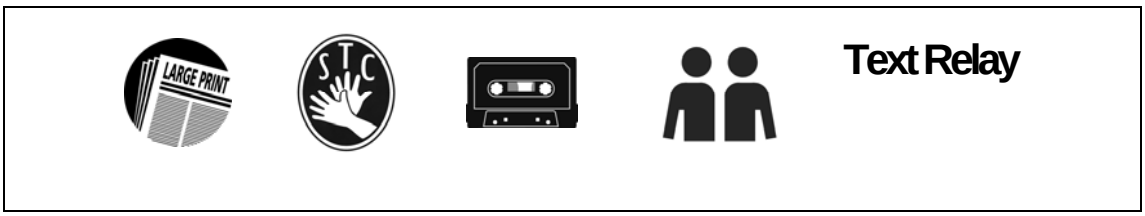

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Executive summary

This paper outlines recent developments in anaerobic digestion (AD) from national and local perspectives, highlighting trends, initiatives and market outlook.

AD is an efficient microbiological process that breaks-down biomass in the absence of oxygen to create biogas and digestate, a nutrient rich organic substance. Biogas can be used to produce heat, through burning, and can be used in engines to generate electricity i.e. for Combined Heat and Power (CHP). It can be used directly as a natural gas or fuel for a vehicle, providing it has been cleaned sufficiently. Digestate can be used as a fertiliser / soil improver.

The AD industry has experienced steady growth nationally and locally, reflecting the flexibility of this technology and policies that have helped the market to develop.

In March 2015 Somerset was reported to have the largest capacity for anaerobic digestion in south west England, according to data published by RegenSW (11 MW of electricity and 6.1 MW of thermal). The Somerset Minerals and Waste Annual Monitoring Report 2014-15 notes that there were five new AD projects in Somerset within the 2014-15 monitoring period, contributing 0.6 MWe to the total.

National schemes such as the Renewable Heat Incentive (RHI) and the Feed-In Tariff (FiT) have provided incentives that promote the use of renewable heat and electricity generation. Both schemes are undergoing change, making the outlook less clear.

Steps are being taken by industry to improve the efficiency of AD operations and maximise the value of AD outputs. The Green Gas Certification Scheme (GGCS) has contributed to the successful uptake of “gas to grid”, through guaranteeing the origin of the biogas. There are several gas-to-grid projects emerging in Somerset, and this is a trend that looks set to continue.

Nationally there is evidence that the current collection of feedstock cannot satisfy the capacity requirements of new AD plants. Whilst the same picture has yet to be demonstrated in Somerset, much depends on the continuation and improvement of efficient methods of waste collection. The Somerset Waste Partnership’s recent Food Waste Improvement Project helps to demonstrate the value in diverting more food waste from “black bag” residual waste bins.

The Green Investment Bank highlights that the agricultural AD market remains attractive; and notes advances being made in operational performance and scope for greater consolidation which could prove attractive to investors.

Key topics to consider going forward, as outlined in the concluding section of this topic paper, are: the importance of separate food waste collection; promoting efficient operations; financing new development; and planning policy considerations.

Building on a strong platform in this sector, it is important to ensure that local waste planning policy adequately addresses AD, thereby supporting further growth, more efficient operations, and clarity in factors that inform decision-making. It is hoped that this topic paper can provide a useful reference in related discussions.

1. Introduction

1.1. Bioenergy is a significant part of the renewable energy mix, and accounts for 10% of the world total primary energy supply today.[1] The value of innovation to the UK energy system from bioenergy use is estimated to be £42 billion.[2]

1.2. In South West England in 2015 there were over 100,000 projects delivering renewable electricity and/or renewable heat.[3] Whilst this is dominated by solar, anaerobic Digestion (AD) contributes 14 % of renewable energy generation in South West England, and growth in this sector continues.

1.3 This paper outlines the basics of AD, recent developments nationally and locally, and the outlook linked with emerging technologies and opportunities.

[1] International Energy Agency – https://www.iea.org/topics/renewables/subtopics/bioenergy/

[2] Low Carbon Innovation Coordination Group – Technology Innovation Needs Assessment (TINA) – Bioenergy summary report, September 2012

[3] RegenSW, South West Renewable Energy Progress Report 2015

Anaerobic Digestion (AD): the basics

1.4. AD is a natural process in which microorganisms break down organic matter in the absence of oxygen into biogas and digestate.[4] Biogas is a mixture of carbon dioxide and methane and digestate is a fertiliser, rich in nitrogen.

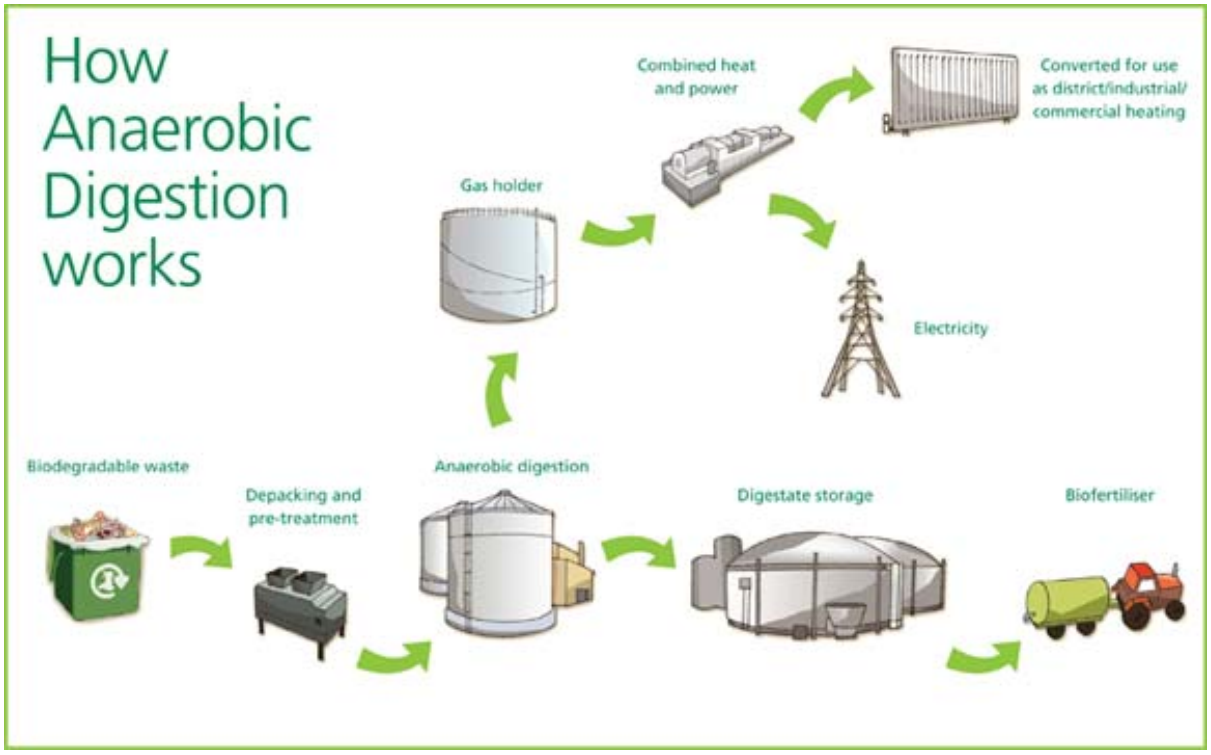
1.5. Biogas can be burned to produce heat, and used directly in engines to generate electricity i.e. for Combined Heat and Power (CHP).

1.6. Alternatively, if it is cleaned sufficiently, biogas can be added direct to the gas grid or used as fuel for a vehicle.

1.7. Digestate produced from AD can be used to condition soil to specific characteristics and used as a fertiliser.

1.8. Figure 1 is a process diagram on how AD works.

Figure 1 - Process Diagram for AD (Source: http://recycleforwales.org.uk/sites/default/files/pictures/AD_Process_Diagram.png)



[4] DEFRA, Anaerobic Digestion and Strategy and Action Plan - a commitment to increasing energy from waste through Anaerobic Digestion, 2011

2. National picture

Anaerobic Digestion Strategy and Action Plan

2.1. The government's Anaerobic Digestion Strategy and Action Plan outlines the national position on AD in 2011. It notes that biogas is most commonly used for Combined Heat and Power (CHP) generation or for heat generation in boilers, and that there were 54 operational AD facilities in the UK in April 2011 (excluding sludge treatment plants). Two facilities are referenced that will inject bio methane into the gas grid.

2.2. In February 2015 the Department for Environment, Food and Rural Affairs (DEFRA) updated the picture,[5] reporting that by September 2014 the number of AD plants in the UK had risen to 140 and installed capacity increased fourfold compared with 2011. In addition to this, over 200 more plants had received planning permission. Amongst highlights, the report noted:

- Renewable energy generation is increasing annually. Approximately 1.5 TWh was generated in 2013, which bodes well for achieving the 3-5 TWh by 2020 that was outlined by the 2011 Strategy and Action Plan.
- Strong growth in the biomethane to grid market, due to the Feed in Tariff (FiT), Renewables Obligation and the Renewable Heat Incentives (RHI). Eight installations were registered under the RHI, with more than 20 in the pipeline.
- New tools developed by the Waste and Resource Action Programme (WRAP) to help businesses procure and implement food waste collection services.

ADBA market update (2015)

2.3. The Anaerobic Digestion and Bioresources Association (ADBA) produced a detailed market report in July 2015.[6] The report notes there are over 400 plants operating in this sector, indicating significant growth in this sector.

2.4. Such growth can partly be explained by the policy measures to support AD, beginning in 2002 by the introduction of the Renewables Obligation (RO). The RO places an obligation on UK electricity suppliers to source an increasing proportion of the electricity they supply from renewable sources.

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/406928/pb14019-anaerobic-digestion-annual-report-2013-14.pdf

[6] http://adbioresources.org/docs/July_2015_Market_Report.pdf

2.5. In 2010 the Feed-in Tariff (FiTs) was introduced, to strengthen the market for renewable electricity generation, followed in 2011 by the Renewable Heat Incentive (RHI). Both measures had the effect of encouraging investment in AD. More information on FiTs and the RHI is included below.

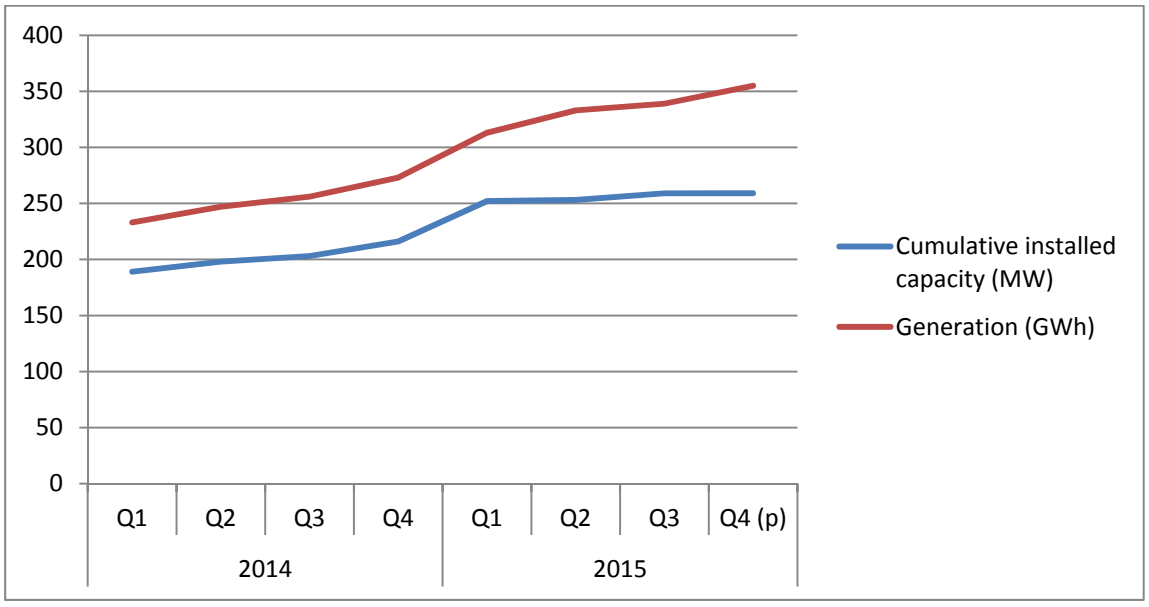
2.6. ADBA notes that between 60 and 100 new plants are to be commissioned in 2015, following 102 plants commissioned in 2014. 1.6 million tonnes of food waste are now being recycled via AD compared with 0.3-0.4 million tonnes in 2010; and with reasonable policy changes, ADBA estimates the sector could deliver 500 more plants by 2020.

2.7. Alongside the positive messages, ADBA also alludes to serious challenges from 2016 onwards. Factors that could make it harder for AD developers in the future include lower rates for FiTs, lower biomethane RHI tariffs for larger plants, concerns about feedstock availability and general policy uncertainty.

Energy outlook

2.8. Government statistics show a quarterly breakdown of the energy generation market. Figure 2 shows the cumulative installed capacity and the energy generation (GWh) on a quarterly basis regarding AD. Noting figures for the final quarter of 2015 are provisional, since 2014 cumulative installed capacity has increased by almost 20% and generation increased by over 30%.

Figure 2 - AD electricity capacity and generation (source: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/462645/Renewables.pdf)



2.9. As mentioned above, the Feed-in Tariff (FiTs) and Renewable Heat Incentive (RHI) have been important policy drivers in the growth of AD.

2.10. FiTs provide a financial incentive to encourage the uptake of renewable electricity. Most domestic renewable and low carbon electricity-generating technologies quality for the scheme, including AD with a total installed capacity of 5MW or less.[7]

2.11. The Department of Energy and Climate Change (DECC) reports that on average, in terms of installed capacity, AD plants are larger than other technologies supported by the FIT.[8]

2.12. Changes to FIT were announced by government in December 2015: https://www.gov.uk/government/news/changes-to-renewables-subsidies. This followed consultation on proposed updated tariffs for solar, wind and hydro power. Government announced revised tariffs, including a new tariff for domestic-scale solar, and the following additional measures:

- Deployment caps will be set to limit new spending on the scheme to £100m up to the end of 2018/19
- The reintroduction of pre-accreditation for solar PV and wind generators over 50kW and all hydro and anaerobic digestion generators
- Measures to pause new applications to the FIT scheme from 15 January to 8 February, to allow time for the implementation of cost control measures.

2.13. The government has also indicated that the FiTS scheme intends to consult this year on support for AD.[9]

2.14. The RHI also provides a financial incentive to operators of renewable energy facilities, focusing on renewable heat not electricity. The RHI allows operators to earn a fixed income for every kilowatt hour of renewable heat they produce. There is a non-domestic RHI scheme and a domestic RHI scheme.

2.15. Government statistics in mid-2015 report that for non-domestic RHI schemes there were 13,958 applications to the join the scheme since it was launched in 2011. [10] There was a combined capacity of 2.2 GWs as a result. For domestic RHI, there have been 42,741 unique applications to join the scheme.

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[7] Energy Saving Trust, information on the Feed-in Tariff scheme available from: http://www.energysavingtrust.org.uk/domestic/feed-tariff-scheme

[8] DECC, Performance and Impact of the Feed-in Tariff Scheme: Review of Evidence, 2015

[9] The Renewable Heat Incentive: a reformed and refocused scheme, Paragraph 6.3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505972/The_Renewable_Heat_Incentive_-_A_reformed_and_refocussed_scheme.pdf

[10] DECC, Renewable Heat Incentive quarterly statistical release, deployment to June 2015, 2015

2.16. Proposed reforms to the RHI were published by DECC in March 2016.[11] Regarding AD, the reform document indicates that RHI is already exceeding expectations and that "*This suggests a higher biogas tariff level is not needed to stimulate deployment and we do not therefore propose that a higher tariff is needed*". The document also notes that "*Since biogas CHP installations can accredit under both FITs and the Non-Domestic RHI scheme, any changes that might result from the FITs consultation will be considered when developing proposals under the RHI*".

Addressing the feedstock famine

2.17. Concerns about feedstock availability for AD have been raised by a number of stakeholders. In 2014 the Eunomia consulting firm prepared a report addressing the proposed feedstock famine, suggesting that the UK market has reached a 'tipping point' beyond which there is not currently sufficient feedstock being collected to support the operation of new AD facilities designed to treat food waste.[12]

2.18. The report noted that the majority of food waste from the food and manufacturing industry is already separately collected; however, this is largely destined for alternative markets/other beneficial uses such as the animal and pet food industry. Nationally only a small fraction of domestic and commercial food waste is currently being separately collected; and a significant amount of food waste is left in the residual stream as a result.

2.19. Concerns about feedstock availability have the potential to undermine confidence in the AD industry, and it would appear that new methods are needed to increase availability of feedstock from the domestic and commercial sectors. Eunomia's recommendations for 'unlocking' food waste include:

- Weight-based pricing mechanisms (immediate term)
- Collaborative methods regarding waste collection for individual businesses (immediate term)
- Greater adherence to the waste hierarchy (short-medium term)
- Following Scotland's requirement for businesses to sort food waste at source, this should be made a requirement in England and Wales (short-medium term)
- Finally, to introduce a requirement for local authorities to start a service for separate food waste collection to households (short-medium term).

[11] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505972/The_Renewable_Heat_Incentive_-_A_reformed_and_refocussed_scheme.pdf

[12] Eunomia, Anaerobic Digestion Market Update – Addressing the Feedstock Famine. 2014.

Food Waste Briefing Paper (2015)

2.20. A food waste briefing paper prepared by the House of Commons in mid-2015 describes the overview of food waste in the UK.[13] The paper estimates that the UK produces 15 million tonnes of food waste per annum, with UK households producing almost half of this. It notes that this waste has environmental, social and economic consequences and highlights the role of the EU Waste Framework Directive as an important driver of UK waste policy, with food waste prevention as priority.

2.21. The paper notes that England has the highest rate of food waste sent to landfill in the UK, and that the responsibility and the costs incurred for food waste collection and disposal comes down to the local authorities. In England there is no mandatory requirement for separate food waste collection or any requirement to send food waste to AD facilities.

2.22. The briefing paper acknowledges the work of the Waste Resources Action Plan (WRAP), which 'leads the UK effort to prevent and reduce food waste'. WRAP is supported by funding from Defra (40%) and the Devolved Administrations (50%). There have been restrictions in funding for WRAP and as a result they have recently become a registered charity.

2.23. WRAP is leading the delivery of The Courtauld Commitment.[14] The Commitment was launched in 2005 to improve resource efficiency and reduce waste within the UK grocery sector. Courtauld 2025 builds on this foundation, as a ten year commitment to identify priorities, develop solutions and implement changes at scale.[15]

2.24. WRAP also launched a campaign in 2007 called LoveFoodHateWaste. This aims to help consumers and households minimise food waste and ultimately save money as a result.

[13] Downing, E. and Carr, W. (2015) Food Waste Briefing Paper. Number CBP07045, 10 June 2015

[14] http://www.wrap.org.uk/content/courtauld-commitment-2025?gclid=CKqo5o7Y6MsCFSsz0wodOuYAqA

[15] http://www.wrap.org.uk/content/courtauld-commitment-2025

3. Local picture

3.1. In March 2015 Somerset was reported to have the largest capacity for anaerobic digestion in south west England, according to data published by RegenSW (11 MW of electricity and 6.1 MW of thermal).[16]

3.2. The Somerset Minerals and Waste Annual Monitoring Report 2014-15 notes that there were five new AD projects within the 2014-15 monitoring period, contributing 0.6 MWe to the total.

3.3. ADBA provides a geographical breakdown on AD in each county in England (excluding the water sector). Table 1 summarises the breakdown of facilities in Somerset as reported by ADBA, including statistics on facilities with planning and application submission stages.

Table 1 Somerset AD breakdown (ADBA 2015)

Somerset	No. of plants	MWe	m³/hr	Agricultural (tonnage per year capacity)	Industrial (tonnage per year capacity)	Municipal/Commercial (tonnage per year capacity)
Operational	8	10	1,250	140,150	0	148,825
With planning	14	21	0	162,741	20000	224,000
Application submitted	2	2	0	0	0	30,000

3.4. Table 1 indicates the scope for significant further increases in Somerset's AD capacity, providing the 14 facilities with planning permission and the two with application submission become operational. This depends, in part, on a well collaborated feedstock collection service.

3.5. The market update from Eunomia in 2015 acknowledges that food production sectors are actually trying to reduce their initial food waste output, due to reasons such as the increased landfill tax and the implementation of the waste hierarchy. As a result, more data may be needed to establish with more confidence the assessment of feedstocks in the future on both a local and national level.

3.6. Table 2 provides more information on current and proposed AD facilities in Somerset, sourced from SCC data.

[16] https://www.regensw.co.uk/wp-content/uploads/2015/07/ProgressReport_20151.pdf

Table 2 - AD Facilities in Somerset (Source: SCC, 2015)

Operator	Site name	District	Status
Barber, AJ & RJ & Peter Horner	Maryland Factory AD Plant	Mendip	Operational
Cannington Enterprises Ltd	Swang Farm	Sedgemoor	Operational
Clayton, Mr Mark	The Green, Brompton Ralph	West Somerset	Operational (Agricultural)
Dillington Farms	Whitelackington Farm	South Somerset	Operational (Agricultural)
Greener For Life Energy Ltd	Frogmary Green Farm	South Somerset	Operational (Agricultural)
Green Spirit Fuels	Land at Henstridge Airfield	South Somerset	*Not known*
Greener for Life Energy Ltd	Land OS 0002, Bearly Lane, Tintinhull	South Somerset	Operational (Agricultural)
Manor Farm Dairy	Manor Farm Dairy	Mendip	Operational (Agricultural)
Organic Power	Organic Power	South Somerset	Operational (R&D)
Rushywood Farm	Rushywood Farm	South Somerset	Operational (Agricultural)
Snowdon Energy Ltd	Snowdon Hill Farm	South Somerset	Operational
Stockbridge Farm	Stockbridge Farm	South Somerset	Operational (Agricultural)
Tamar Energy	Unit 22 – Evercreech Junction	Mendip	Planning permission only
TR Millard & Partners	Double Gate Farm	Mendip	Operational (Agricultural)
Viridor	Walpole - AD plant	Sedgemoor	Operational
Wyke Farms Ltd	Lambrook AD Plant	Mendip	Operational

AD in Somerset using household food waste

3.7. Somerset Waste Partnership (SWP) was established in 2007 to manage waste services on behalf of Mendip, Sedgemoor, South Somerset and West Somerset District Councils, Taunton Deane Borough Council and Somerset County Council. It was the first county wide waste partnership in the country.

3.8. SWP has delegated authority to deliver household waste and recycling services throughout Somerset, including management of kerbside collections, recycling sites and disposal sites.

3.9. Table 3 shows kerbside collection of food waste over the period 2014-2015: http://www.somersetwaste.gov.uk/about/end-use/. Most of the county's local authority collected food waste is sent to Walpole AD facility operated by Viridor.

Table 3 - Somerset Waste Partnership: Recycling End Use Register

Kerbside Collections (2014/15)	Recycled (Tonnes)	Carbon Saved (Tonnes CO2 equivalent)	Reprocessor	Final Use
Food Waste	236.18	79.12	Cory Env. WSM	Bio fertiliser and biogas
	12,726.38	5,345.08	Viridor AD, Walpole	
	2,350.92	987.39	Cannington AD, Bridgwater	
	203.42	85.44	Langage AD, Devon	
	23.92	10.05	Eco Composting AD, Dorset	

3.10. The Walpole AD facility, located at Walpole near Bridgwater, Somerset, is successfully processing household food waste that has been collected for recycling in Somerset, with an additional capacity for food waste from commercial sources.[17] The process is shown in Figure 3 overleaf.

3.11. The facility is able to process up to 30000 tonnes of food waste per annum, two thirds provided by the SWP. Providing the demand is sufficient for the facility, the planning consent allows the facility to expand to a further 15000 tonnes per annum, bringing in a potential of 45000 tonnes per annum.

[17] http://www.somersetwaste.gov.uk/about/ad/

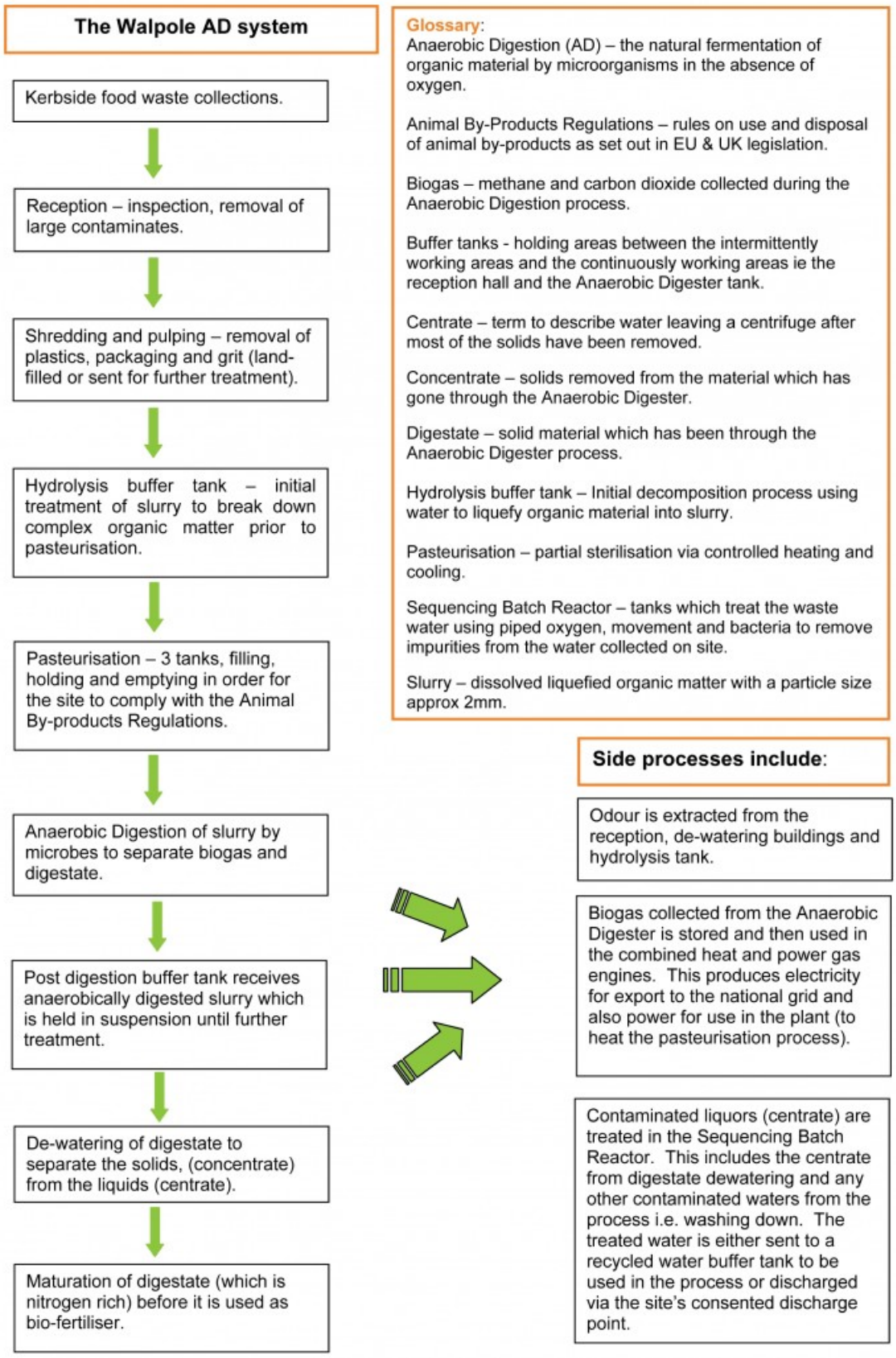

Figure 3 - The Walpole AD system (Source: http://www.somersetwaste.gov.uk/about/ad/how/)

3.12. Acknowledging the importance of food waste collection, SWP organised a project to help increase the recycling of food waste in Somerset. The project intended to reduce the amount going to landfill in March 2015, and covered 115,000 homes in Sedgemoor, Taunton Deane and the Ilminster area.[18]

3.13. Through advertisement, and kerbside deliveries of kitchen caddies and biodegradable bags, there was a 20% increase in food waste recycling in the specified areas.

3.14. In June 2015, a SWP board meeting looked at the outcome of the food waste collection improvement project and offered possible next steps. The report looked at getting confirmation that the SWP's liner policy can reapply in the areas previously mentioned, and further extend the project to the rest of the county. This would be funded by the savings made by SCC from the success of previously diverting food waste from landfill, to recycling.

3.15. Recommendations were given based on this, and it was decided that supplying free liners would not be justifiable, so households would have to buy biodegradable bags themselves. However, extending the food waste collections improvement project to the remainder of the county should save money, and help divert food waste from landfill.[19]

3.16. If the biogas produced by the Walpole facility were cleaned, it could be sent to the national gas grid or perhaps used to fuel waste management vehicles.

AD in Somerset using commercial food waste

3.17. There are several existing AD facilities in Somerset that depend on commercial food waste and/or other sources of feedstock (rather than food waste from Somerset's households).

3.18. The AD facility at Swang Farm, run by Cannington Enterprises Ltd, processes locally-sourced agricultural feedstock and commercial food waste, combined with similar types of material sourced from outside Somerset. It has a significant throughput, receiving almost 18,000 tonnes in the final quarter of 2015.

[18] SWP, Food Waste Improvement Project. http://www.somersetwaste.gov.uk/collections/td/food-waste-project-2015/

[19] http://www1.somerset.gov.uk/council/board32%5C2015%2019%20June%20Item%2010%20Food%20Waste%20Collection%20Improvement%20%20Project.pdf

3.19. As another example, Wyke Farms AD facility processes cheese processing waste and animal slurry.[20] In January 2016 Sainsbury's and Wyke Farms announced a green gas partnership, which will see Wyke Farms supply a proportion of the supermarket chain's green gas.[21]

3.20. One of the local facilities yet to be constructed is a proposal by Tamar Energy, where the planning application gives an insight into the considerations facing promoters of merchant AD plant.[22] RUR³ Environmental Ltd produced a report on the 'availability of food waste arisings for the proposed Anaerobic Digestion Plant at Evercreech' in July 2013. This report highlights the importance of the necessary feedstock for the plant to effectively operate. It also gives an idea to the feedstock availability in Somerset, by assessing food waste arisings from a 30-mile radius to the proposed plant. This reaches a southerly tip near Dorchester, and a northerly tip towards Bristol. Five waste generating sectors within this area were identified, as shown in Table 4.

Table 4 - Summary of Food Waste Arisings (adapted from RUR3, 2013)

Sector	Frequency in 30 Mile Radius	Potential Tonnage per annum
Local Authority (households)	10	59,808
Food Manufacturers	168	109,200
Food Retail Distribution Centres	6	15,600
Hospitality	3,415	17,034
Schools	933	3,241
Equates to:		204,883

3.21. Table 4 gives a general outlook on the potential food waste feedstock in the surrounding area to the proposed AD plant at Evercreech. The 10 local authorities in the chosen radius consist of nine which collected food waste separately, and one that does not collect food waste.

3.22. In terms of other facilities that may impact on local demand for food waste, four plants were listed that produce biogas, and one that produces compost, thereby representing potential competition for feedstock:

- Dimmer Organic Waste Treatment Facility (Castle Cary)[23]
- Malaby Biogas Ltd (Warminster)
- Blackmore Vale Farm Cream Ltd (Shaftsbury)
- Cannington Enterprises Ltd (Bridgwater)
- Geneco (Avonmouth)

[20] http://www.biogas-info.co.uk/resources/biogas-map/

[21] http://www.edie.net/news/6/Sainsbury--and-Wyke-Farms-form-yearlong-green-gas-partnership/

[22] Tamar Energy, Anaerobic Digestion for Evercreech: http://www.tamar-energy.com/evercreech/about-us

[23] Note the In-Vessel Composting facility referenced here is no longer operational

3.23. It is noted that this perspective looks beyond the county boundary i.e. outside the Somerset waste planning authority area, reflecting the cross-boundary nature of waste movements and the wider waste market. At the time of writing this topic paper, the position of the Tamar AD facility is unclear.

Agricultural AD in Somerset

3.24. One of the noteworthy aspects evidenced from Table 2 is the significant number of operational agricultural AD facilities in Somerset, arguably unsurprising given the rural nature of the county.

3.25. Agricultural AD facilities tend to blend a mixture of feedstocks, such as cow and/or pig slurry, chicken litter, and crop residues.[24] The by-products from food and drink manufacturing processes can also be processed, exemplified by Wyke Farms AD facility as mentioned above.

3.26. According to the Design, Access & Energy statement for the Wyke Farms AD facility,[25] the plant: "*will be provided with feed stocks from a combination of pig slurry from the adjacent Lambrook pig unit, cow slurry from Wyke Farms three dairy farms situated in the village of Wyke Champflower and coproducts from the manufacture of cheese in the Wyke cheese dairy. Whey permeate (the lower value milk sugar-lactose) remaining after cheese production and milk rich waste (from washing the cheese plant), will be pumped by underground pipeline to the propose plant.*"

3.27. Given the flexibility of AD, in two tier areas such as Somerset proposals for AD facilities may be determined by District Local Planning Authorities as renewable energy development; or they may be determined by the Waste Planning Authority (WPA) – namely Somerset County Council (the WPA for Somerset excluding Exmoor National Park).

3.28. A decision on who should determine any such AD application is made on a case-by-case basis. In cases where all the feedstock is waste this decision is straight-forward. Similarly, it is straight-forward when none of the feedstock is formally a waste e.g. when all of the material is an energy crop.

3.29. The decision becomes potentially more difficult when there is a blend of materials, when there are various factors to consider that would inform the decision taken.

[24] More detail on common feedstocks is available at http://www.biogas-info.co.uk/about/feedstocks/

[25] See application 2012/1085 at www.somerset.gov.uk/planning

3.30. One important factor is whether or not the Environment Agency regards the feedstock as a waste. A briefing note prepared by the Environment Agency in 2014 offers guidance on this subject.[26]

3.31. If the proposed facility is intended to provide a waste management function for a number of farms, it is more likely to be considered a waste development. Given this is not a "black and white" issue, good communication is essential to ensure it is clear which authority is best placed to handle the application.

Gas to grid developments in Somerset

3.32. As well as significant developments in agricultural AD, the Somerset AD sector in Somerset is also showing increasing interest in "gas-to-grid".

3.33. Exemplifying this, in April 2015 the operators of the AD plant at Swang Farm, Cannington were granted planning permission to erect and use a biogas upgrading plant. According to their Planning Statement,[27] the biogas upgrading facility will work by separating carbon dioxide and hydrogen sulphide from the biogas under pressure, by absorption into the water. The absorbed methane is 'flashed' off and recovered by returning it to the start of the process. This process is stated to produces gas with methane content exceeding 97%. A drier-purifier "polishes" final gas quality.

3.34. The applicant linked with Swang Farm's biogas upgrading plant noted that "*The connection of the biogas upgrading facility to the national gas grid will be undertaken by a public gas supplier and therefore will be permitted development*". Stated benefits of this "gas to grid" approach include:

- Biomethane can be used in the same way as natural gas to provide heat and power to homes and businesses;
- Biomethane has a higher energy density than biogas;
- Biomethane is a renewable gas source which can reduce carbon emissions and enhance the security of the UK energy supply.

[26] http://www.r-e-a.net/images/upload/news_270_140910_EA_Briefing_note_-_crop_residues_used_as_feedstocks_in_AD_plants.pdf. As mentioned in this guidance note, the Environment Agency recommended to Defra that consideration be given to the case for regulating AD under the Environmental Permitting Regulations irrespective of the feedstock used.

[27] See application 1/45/15/002 at www.somerset.gov.uk/planning

4. Outlook

4.1. This section gives a glimpse into the current opportunities, challenges and areas for growth for AD on national and local contexts, in terms of:

- The importance of separate food waste collection
- Promoting efficient operations
- Financing new development
- Planning policy considerations

The importance of separate food waste collection

4.2. The importance of feedstock supply has already been noted in this paper. In Somerset separate household food waste has been collected for a number of years by the Somerset Waste Partnership (SWP).

4.3. However, whilst SWP's kerbside collection captures some of the food waste we produce, there remains a proportion of food waste in residual (black bag) household bins.

4.4. Targeting this feedstock, SWP's Food Waste Improvement Project for Somerset[28] delivered a 20% increase in food waste recycling. Ensuring that as much food waste as possible is diverted from the residual waste stream remains an important priority.

4.5. Nationally there is an increasing push toward greater harmonisation of household waste collections – and it was reported (in February 2016) that a WRAP-led steering group has announced plans to produce a publication this summer outlining its vision aimed at harmonising UK food waste collections.[29]

4.6. DEFRA acknowledged the importance of feedstock supply in their Anaerobic Digestion Strategy and Action Plan annual report for 2014, from both domestic and commercial sources. It noted that collection of food waste will ultimately determine the rate of expansion of the food waste treatment sector.

4.7. Quoting from DEFRA's AD Strategic and Action Plan: "*It is encouraging to see the recent expansion in plant numbers treating commercial food waste from food manufacture*".

[28] http://www.somersetwaste.gov.uk/collections/td/food-waste-project-2015/

[29] http://adbioresources.org/news/tag/1416-rory-stewart

4.8. For further insights, a presentation at the RWM 2015 event by Suez Environment[30] noted the importance of understanding the incentives and policy drivers and the need for investment not only in facilities but also in the knowledge and practice of AD, and in the network and associations that hold the industry together.

Promoting efficient operations

4.9. Looking beyond waste collection, it is important that further improvements are made to the environmental and operational performance of AD facilities, not least linked with growth of UK knowledge and skills in the AD sector.

4.10. DEFRA have highlighted that the number of serious or potentially serious pollution incidents at AD plants remains a serious concern, implying the need for minimum core training requirements for AD plants that will increase the safety of operations and potentially increase efficiency in the future.

4.11. DEFRA notes that the Renewable Energy Association and ADBA participate in a stakeholder group to improve sector competence: *"This group is producing core minimum training for all operators, a draft syllabus, and a framework to establish "on the job" training at all AD plants in the UK, to steer trainers to develop courses in line with core requirements and establish on-site training venues*".[31]

4.12. As acknowledged previously in this paper, the flexibility of AD as a technology allows operators to consider more than just renewable electricity generation. "*Electricity only production is the least efficient use*" according to the Parliamentary Office of Science and Technology.[32]

4.13. Furthermore, it is noted that there are constraints within the power grid in the South West region.

[30] UKTI (2015) "Food Waste – From Collection to Treatment" available from: https://www.youtube.com/watch?v=P3TRugR6xGk&feature=youtu.be&mkt_tok=3RkMMJRkMM9wsRoiu63MZKXonjHpfsX77O4oX6G2lMI%2F0ER3fOvrPUfGjI4ET8djI%2BSLDwEYGJlv6SgFSbLBMbFy0rgOUhc%3D

[31] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/406928/pb14019-anaerobic-digestion-annual-report-2013-14.pdf

[32] http://www.parliament.uk/documents/post/postpn387_anaerobic-digestion.pdf

4.14. Focusing on “gas to grid”, the Green Gas Certification Scheme (GGCS) tracks biomethane through the supply chain and provides certainty to those who purchase it.[33]

4.15. The GGCS scheme provides information on the origin of the gas to the customer, helping to address any concerns about the authenticity of ‘green gas’ (due to its appearance being the same as natural gas). By January 2015 there were 28 biomethane to grid projects connected to the distribution network for gas. These plants alone have the capacity to produce 1.8 bn KWh of gas per annum, which could potentially meet the needs of 100,000 homes.

4.16. Alternatively, biomethane can be used as a transport fuel. Whilst only a small amount of biomethane is produced with the intent to supply the transport sector,[34] the use of biomethane in vehicles could deliver ‘substantial greenhouse gas savings’ compared to the use of conventional fossil fuels.[35]

4.17. To exemplify this, a VW beetle in Bristol named the ‘Bio-Bug’ runs on methane gas generated during Wessex Water/GENeco’s sewage treatment process.[36]

4.18. The other key output from AD is digestate, which can be used as a fertiliser or as a substance to condition specific soil types. Currently the market for digestate is supported by a range of tools and schemes, including:

- The AD Quality Protocol[37] established by the Environment Agency and WRAP details the end of waste criteria for the production and use of quality outputs from AD of source-segregated biodegradable waste. It helps to convey the circumstances when the digestate is considered no longer a waste. If not certified to the Quality Protocol standard, the digestate is still a viable alternative to manufactured fertilisers but it would need to be spread to land under a waste exemption/permit issued by the Environment Agency.
- The Protocol should be considered in connection with the British Standards Institutions (BSI) specification for biofertiliser – or PAS110 for short – which is an industry standard against which producers can verify that their products are of consistent quality and fit for purpose.[38]

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[33] http://www.greengas.org.uk/news/biomethane-green-gas-is-growing-contender-in-uk-renewable-energy-market

[34] DfT. Renewable Transport Fuel Obligation Statistics, Year 6, Report 5. [Online] available from: https://www.gov.uk/government/statistics/biofuel-statistics-year-6-2013-to-2014-report-5, 2014

[35] Ricardo – AEA, Biomethane for Transport from Landfill and Anaerobic Digestion. Ricardo-AEA/ED60023/Issue number 2, 2015

[36] http://www.geneco.uk.com/Biobug/biobug.aspx

[37] http://www.biofertiliser.org.uk/adqp

[38] http://www.wrap.org.uk/content/bsi-pas-110-producing-quality-anaerobic-digestate

- In addition, the Biofertiliser Certification Scheme (BCS) provide assurance that biofertiliser is of good quality.[39] BCS also aim to provide assurance that digestate produced from AD operations are safe for human, animal and plant health. March 2015 saw the 30th AD plant to be certified under the BCS.[40]

4.19. In 2011 one of the recommendations of a note on AD prepared by the Parliamentary Office of Science and Technology was to monitor the impacts of digestate use on soil and water quality.[41] Reviewing the impact of digestate use, a research project on digestate and compost in agriculture (DC-Agri project) recently published its final reports and demonstrated that digestates and composts can increase yields with no negative impacts on crop quality or safety, and that compost can increase soil organic matter more quickly than other organic materials.

4.20. The results from the DC-AGri project also revealed how farmers can make the most of the nitrogen fertiliser value in food-based digestate, but underlined the high economic and environmental cost of applying it when crops do not require nitrogen. A summary from this research project is available to download from the WRAP website.[42]

4.21. Going forward, as noted by DEFRA, there is scope to explore digestate management options that could produce higher value products or even feedstocks for high value chemical engineering chains (meaning that there may be synergies in the co-location of AD facilities with other enterprises).

Financing new development

4.22. The amount of investment in the AD sector in 2015 was estimated by ADBA to be between £330m-£520m, less than the £580m invested in 2014.[43] The majority of this investment will be in the construction of new AD plants.

4.23. Expenditure on operations and maintenance is increasing each year, and reached £160m-£180m in 2015. ADBA expects this expenditure on operations and maintenance will increase by £5m-£30m per year for the next five years.

[39] http://www.biofertiliser.org.uk

[40] http://www.biofertiliser.org.uk/news/bcs-certifies-30th-ad-plant-as-european-commission-halts-revision-of-eu-fertiliser-regulations

[41] http://www.parliament.uk/documents/post/postpn387_anaerobic-digestion.pdf

[42] http://www.wrap.org.uk/content/digestate-and-compost-agriculture-dc-agri-reports

[43] http://adbioresources.org/docs/July_2015_Market_Report.pdf

4.24. The Green Investment Bank has noted a clear shift towards agricultural and gas-to-grid projects in the AD market, alongside a 'tightening' in the segregated food waste market and degression (downward movement) of Feed-in Tariffs.[44] It noted that the capacity available for the treatment of source segregated food waste has far exceeded the growth in food waste supply, but "*Whilst there is limited room for growth in food waste AD, the agricultural AD market remains attractive*".

4.25. New investors may be attracted to the market by the improving operational performance of the sector and the possible opportunity for consolidation.

4.26. DEFRA has noted that a £200 million Innovation Fund for low carbon technologies, provided by the Department for Energy and Climate Change for 2011-2015, "*included successful applications from AD developers, which has contributed to the development of the AD sector as a whole*".[45]

4.27. In terms of funding to support the development of small scale AD facilities, WRAP developed a programme aiming to help farms in England access financial support.[46] The operation of this fund is currently under review.

4.28. Another potential funding stream may be available via the LEADER programmes, which form part of the Rural Development Programme for England.[47] National priorities for the LEADER programmes include (amongst others) support for increasing farm productivity; and support for micro and small enterprises and farm diversification. However, clarification is needed on the position taken regarding the LEADER programme and AD in the context of renewable energy generation.

[44] http://www.greeninvestmentbank.com/media/44758/gib-anaerobic-digestion-report-march-2015-final.pdf

[45] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/406928/pb14019-anaerobic-digestion-annual-report-2013-14.pdf

[46] http://www.wrap.org.uk/content/farm-ad-fund

[47] Rural Development Programme for England, available from: https://www.gov.uk/government/organisations/rural-development-programme-for-england-network

Planning policy considerations

4.29. Planning Practice Guidance outlines how local planning authorities can develop a positive strategy to promote the delivery of renewable and low carbon energy.[48]

4.30. Anaerobic digestion can be fed by a wide range of feedstocks, some of which are formally considered a “waste” and some of which are not.

4.31. As outlined earlier, from a planning perspective, in a two tier local authority area such as Somerset, waste proposals for new AD development may be county matters and thus determined by Somerset County Council as the ‘Waste Planning Authority’ for Somerset (excluding Exmoor National Park). Proposals for AD facilities that do not manage feedstock that is defined as a waste are more likely to be determined by the District/Local Planning Authority. Proposed AD facilities that process both waste and non-waste feedstock would be considered on a case by case basis, and could be considered either by District or County planning departments.

4.32. The Somerset Waste Core Strategy (adopted 2013) does not currently include a specific section on anaerobic digestion, though it does make various references to AD in different sections of the document, and it provides a suitable policy framework that can be used to determine AD proposals. The Waste Core Strategy notes the potential for AD in the context of small-scale energy from waste, and the potential for waste management development to play a positive role in agricultural diversification.

4.33. Noting Somerset currently has the largest installed AD capacity in the South West region,[49] and thus has a strong platform on which to build, it is important to ensure that local waste planning policy adequately addresses AD, thereby supporting further growth in this sector, more efficient operations, and clarity in factors that inform decision-making.

[48] http://planningguidance.communities.gov.uk/blog/guidance/renewable-and-low-carbon-energy/developing-a-strategy-for-renewable-and-low-carbon-energy/

[49] https://www.regensw.co.uk/our-work/creating-a-positive-environment/1145-2/progress-report/