BEST PRACTICE CHECKLIST
RISK MANAGEMENT

ADBA

Best Practice in Risk Management

What do we mean by risk management?

AD provides many environmental benefits, not least the generation of renewable energy, contribution to the reduction of carbon emissions and the recycling of nutrients back to the soil through digestate.

However, the construction and operation of an AD plant involves environmental, health and safety, and commercial and reputational risks. These risks are well understood and can be managed if not completely eliminated; the objective of risk management is to identify all potential risks and put in place suitable measures (such as design features or operational procedures) that will reduce these risks to acceptable levels.

This guide explains the different types of risk and why it is important and commercially beneficial to manage them effectively. It is structured as a series of checklists that give an indication of good practice in the management of risks involved in an AD project.

Why is improving risk management important?

Ensuring the health and safety of employees and the public, and the protection of the environment, should be a priority when undertaking any activity that could result in their harm. Organisations should aim for continuous improvement in this regard; although many risk management techniques are obvious and common sense it is important to review the systems in place to ensure they remain effective and fit for purpose.

The failure to identify and manage risks appropriately can result in a disproportionate number of accidents and incidents that have a negative impact on the environment, or on the health and safety of site employees and the public. This leads to a negative perception of the industry, and as a result leads to increased regulatory scrutiny and wariness of insurers and investors who work with the sector.

Effective risk management is commercially beneficial because it should result in:

- Prevention and/or management of pollution incidents and therefore avoidance or reduction of remediation costs.
- Prevention of accidents that could result in harm to employees, prosecution and business disruption.
- Improved reputation of individual companies and the wider industry.
- Better staff retention, by demonstrating commitment to their safety and wellbeing.
- Reduced cost of insurance premiums and better insurance policies.
- Improved operational performance, delivering higher quality outputs.
- Better overall financial performance.

All of the above benefits are drivers of risk management, but ultimately striving for a healthy and safe workforce and a protected environment is simply the right thing to do.

What are the risks associated with AD?

Catastrophic Failure

Due to the nature of AD, there is a risk of 'catastrophic failure' at any plant if risks are not managed appropriately. This means that there can be a complete breakdown of the process, for example through a severe foaming incident or collapse of a tank. As 'catastrophic' implies, this would have extremely negative consequences for the operation of the plant and the revenue it generates, as well as posing a significant risk to the safety of site operatives and the environment. It is vital that operators are aware of the scale of the risk involved in running an AD plant before and throughout operation.

Environmental Risks

An environmental risk is any risk that could cause harm to the environment, for example watercourses, groundwater, air, flora and fauna, habitats and soil. As stated above, AD as a technology provides many environmental benefits but the process of building and operating an AD plant represents a number of risks to the local environment (some of the key ones are listed below). The significance of these risks needs to be assessed for each individual site, as it will depend on the source of the risk, the location of sensitive receptors and the pathway between the source and the receptor.

Key risks to the environment include:

- Leaks and spills of potentially polluting liquids or sludges.
- Spreading of contaminated digestate onto land.
- Uncontrolled venting of gases to atmosphere.
- Noise disturbance to sensitive receptors.

Health and Safety Risks

Building an AD plant presents risks similar to most construction projects, such as working at height, use of machinery and vehicles on site and lifting of heavy items. There are also risks to the health and safety of the site workers who undertake the day-to-day operation and maintenance of the AD plant, with examples listed below. External contractors will be used for certain tasks, which presents additional risk as they may be working on a site that they are unfamiliar with.

Health and safety risks include:

- Slips, trips and falls, and falls from height.
- Fire or explosion from generation and storage of potentially flammable and explosive gases and materials.
- Exposure to toxic gases in confined spaces.
- Site traffic collisions with other vehicles or with workers.
- Generation and emission of odour from feedstock storage.

Commercial and Reputational Risks

In this checklist we do not include a specific section on the commercial risks associated with AD, but there are clear business risks arising from the poor management of environmental and health and safety risks. Taking risk management seriously is vital for ensuring the good reputation of all parties involved in the AD project. Projects that experience health and safety issues or that cause pollution are likely to be perceived negatively by insurers, funders, regulators and the local residents. Depending to some extent on the severity and frequency of these issues, this makes day-to-day operation more difficult, could result in additional regulatory scrutiny and costs, revocation of any Environmental Permit, jeopardised contracts and an increase in insurance premiums or failure to obtain insurance. It could also negatively impact upon any financing or refinancing processes. A poor reputation among local residents can cause difficulty in obtaining planning permission for any changes to existing plants or in developing new plants at other locations.

In terms of direct financial implications, in the event of a pollution incident there may be environmental remediation costs totalling tens of thousands of pounds, representing a substantial insurance claim or loss of assets. The regulators may prosecute the operator, again resulting in significant costs. In the event of a health and safety incident, there may be legal action against the operator as the employer if it is shown that risks were not managed appropriately. There is a range of situations where an operator might incur financial penalties/costs following an HSE intervention. In the event of a serious incident, the operator (company or individual) could be prosecuted (under criminal law) and if found guilty could incur a significant fine or imprisonment. Recent changes in the sentencing guidelines for courts have already seen a significant increase in the size of fines and number of custodial sentences. Additionally, if during an inspection (or a complaint/accident investigation) an HSE Inspector identifies a material breach, then HSE will seek to recover the costs that have been incurred by the inspector during that inspection/investigation, as well as the time that is taken to ensure that compliance with the law is achieved. Depending on the nature and complexity of the incident, the identification of a material breach could result in the HSE seeking significant cost recovery from the operator.

The commercial drivers for managing risks appropriately are indisputable.

Best Practice in Risk Management

How will this checklist help you?

These risk management checklists have been developed by the AD industry to establish best practice in risk identification and management at specified stages of an AD project, from the viability assessment stage through to operation. This list aims to raise awareness of existing tools, relevant legislation and guidance that can be used to identify, assess and manage risks. Key guidance documents, websites etc. are referred to throughout the document, and these are all captured in list of references at the end of the document.

WHO'S WHO?

As these lists cover different stages, they are written for different 'primary users', however ultimately each list should be informative for all parties involved. For the purpose of this checklist, we have defined the primary users of each checklist as shown below. It is feasible that one organisation will act as the developer, contractor and operator, but it is helpful to differentiate between these roles for clarity in this checklist.

Developer – here, 'developer' refers to the organisation or individual that is leading on site selection and plant design. They are likely to be the organisation drawing in the funding, third-party experts or organisations required to progress the project from its conception to being ready to start construction.

Main contractor – although contractors may be used throughout the whole project, we have written the construction checklist with a particular focus on the contractor with overall responsibility for the construction of the plant as the key party during the construction phase.

Operator – this is the organisation that will have responsibility for operating the plant once it is up and running.

To be most effective, risk identification and management processes should take place throughout the AD project, and here we have covered three stages. Separately, it is proposed that we will produce a checklist covering 'Planning and Design' and there may be some crossover between this and risk management.

Stage 1: Preliminary Assessment

In the process of selecting a site and assessing the viability of an AD project, a developer should consider the likely risks involved in the project with a particular focus on the setting and constraints of the proposed site. These constraints will have a direct influence on the significance of the risks involved in building and running the plant at that specific site. This list provides some guidance to developers on what to consider at this stage that can help you make decisions that contribute to the effective management of the risks throughout the project lifetime, rather than needing to make changes at a later date.

Stage 2: Construction

The construction phase of an AD project will be subject to some specific regulations, such as the Construction (Design and Management) Regulations, which are strongly related to health and safety, and risk management. This list provides guidance to 'developers and main contractors' to assist with the identification of these, and the obligations of each party involved. Where relevant, AD-specific risks involved in the construction phases are also listed.

Stage 3: Operation

Prior to the commencement of operations on site, a suitable risk assessment process should be carried out and effective risk management procedures should be put in place. This checklist focusses on the risk management tools available to operators and provides an indication of what should be put in place to work towards best practice.

PRELIMINARY ASSESSMENT

Once an individual or organisation has decided that they are interested in developing an AD project, the first step is to assess whether it is viable, both practically and financially. This stage is also when they, as a potential developer, need to start identifying and assessing the likely environmental and health and safety risks that will be involved in the project, so that they can think about how they will control these risks in advance of proceeding through planning and construction. This process could have implications for the site layout, plant design, size of plant, and even whether the project is feasible, so it should be considered at the earliest stage.

☐ UNDERSTAND YOUR FEEDSTOCK

Why is this important?

At this stage the developer should have a basic understanding of the types of feedstock that they intend to use. Without this understanding, it is difficult to begin to identify or assess the risks.

The type of feedstock that will be used, the quality of the feedstock provided and the way in which it is managed has a big impact on the environmental risks that a plant will pose. For example, food waste and slurries are more likely to generate odour than energy crops and crop residues. Therefore, developers who intend to use feedstocks that have greater potential to generate odours may wish to pick a site that does not have sensitive receptors in close proximity and they may wish) to consider, or be required to use, additional odour control techniques.

Food waste is also likely to be less of a consistent composition and is likely have a higher risk of contamination (such as plastics, glass etc.) than agricultural slurries or crop residues. Such contamination material can accumulate at the bottom of tanks and form a solid layer, which clearly has implications for the operation of the plant.

The feedstock composition will influence the design of plant, the machinery required in the feedstock preparation area and the site layout. For example, animal by-products regulations require that a food waste plant has an enclosed reception hall and pre-treatment processes, whereas a crop-fed plant is more likely to have outdoor feedstock storage areas.

What should developers do?

Developers should build up a profile of the proposed feedstock and discuss this with a technology supplier to understand what technology will be suitable and any specific components of the plant that may be needed (such as pre-treatment processes). If possible, they might find it beneficial to obtain a sample of the intended feedstock and send it for analysis at a laboratory that provides the relevant test services (this is not always possible but in some cases will be). The more that is known about the input material at this stage, the better prepared the developer can be. If the feedstock is not well understood, trials could be undertaken to ascertain which technology is appropriate.

The developer should have an idea of the following, as a minimum:

- What type of feedstock do you intend to use?
- Where will it be sourced from – how far is this from the proposed site?
- How much will be available and how much will be needed for the size of plant?
- How long will it be stored for before use?
- How much odour is it likely to generate?
- How likely is it to contain contamination, such as plastic packaging, glass or pieces of metal?

The developer should consider how feedstock quality can be managed and driven to the highest standard possible.

Find out more

- Environment Agency H4 Guidance on Odour Management http://bit.ly/28NmRve
- Practical Guide to AD: Feedstocks http://bit.ly/28OARG7

Preliminary Assessment

☐ UNDERSTAND YOUR DIGESTATE

Why is this important?

Digestate is often not considered early enough in the project, despite the fact that its storage and spreading requires careful risk management as its uncontrolled release into the environment could result in pollution. Further to this, it is a potential revenue stream. Operators should strive to produce as high quality digestate as possible and consider the quality requirements of relevant regulations and the end-user at an early stage to understand how this might affect the plant design and process.

It is vital that the developer knows how much digestate the plant will produce, so that they can put in place appropriate storage and spreading arrangements. They should bear in mind that there may be certain times of the year when demand for digestate is very low such as from October to March when access to land or spreading of fertilisers is restricted. Operators need to consider what digestate quality they wish to aim for - i.e. do they want a material that is classed as a product, as this will affect the feedstock and digestate processing and storage requirements.

What should developers do?

At an early stage, it is difficult to have a complete understanding of the digestate quality but the quantity should be predictable. The feedstock types used and digestate quality will affect whether the digestate can be spread as a 'waste' or as a 'product' (and therefore the permits required) and its marketability. The quantity generated will affect the amount of digestate storage that needs to be provided at the AD site or at the spreading location, so this is useful to know as early as possible.

The developer should think about:

- What will they do with the digestate that is produced?
- How much will the plant produce and at what rate?
- What level of quality is it likely to be?
- What are the periods of the year when spreading digestate on agricultural land is not allowed, regardless of whether the digestate has waste or product status?
- What quality does it need to be for the specific intended use?
- Will digestate be dewatered, dried, pelletised or spread in its original form?
- Will you aim to meet any product standards?
- How will they monitor digestate quality?
- Where will they store the digestate pending spreading? Can you provide sufficient storage for digestate produced during the times of the year when the digestate cannot be spread (either due to regulatory or practical requirements)?
- What contingency arrangements will they have for failure of expected digestate offtake markets/routes?

Find out more

- ADQP and PAS110 http://bit.ly/28NktD0
- Operational Performance Checklist http://bit.ly/28N8OGQ
- Practical Guide to AD: Digestate http://bit.ly/28MWnqA
- SEPA Position Statement on Classification of Outputs from Anaerobic Digestion Processes http://bit.ly/28Okb2i

☐ UNDERSTAND THE SITE SETTING

Why is this important?

Understanding the site's setting and surroundings is essential when identifying and managing risks. The sensitivity of nearby receptors, which includes local residents, parks, watercourses, groundwater or important wildlife habitats, should be taken into account in risk assessment and management.

It can be advantageous to select a site that does not have a high number of 'potential sensitive receptors', but this is not always possible, making it even more important to understand the local environment.

What should developers do?

Undertake the necessary site searches as early as possible during the site selection and project viability stages. By undertaking these searches, the developer can make fully informed decisions and begin to understand the feasibility of obtaining the necessary planning permission and waste permits.

The searches should include as a minimum:

UNDERSTAND THE SITE SETTING		
Consideration	**What does this mean?**	**Recommended sources**
Flood risk	A site which is at a high risk of flooding would need even more consideration in terms of primary and secondary containment arrangements, as well as flood response measures. This added risk and complexity may even lead a developer to rule out a particular site.	• Environment Agency's What's in your backyard? http://bit.ly/1RfZN7k • Natural Resources Wales Maps http://bit.ly/28M11X0 • Northern Ireland's Flood Risk Map http://bit.ly/28NpXfN • SEPA's Flood Risk Maps http://bit.ly/28P6tMn
Residential dwellings or workplaces	The proximity of residential dwellings, schools, care homes and workplaces affects the likelihood of odour and bioaerosol emissions and noise impacting upon sensitive receptors and reduce the chances of obtaining planning permission for the plant. Odour and noise can cause nuisance and be detrimental to the health and wellbeing of those who are nearby. This may mean that a developer may choose a different site or design the layout differently, and the operator will need to implement additional measures to control these risks.	• Ordnance Survey Maps or Google Maps (or similar) http://bit.ly/28QIsCS
Public footpaths, parks and open spaces	Similar to the presence of residential areas or workplaces, public rights of way, the proximity of footpaths, parks and open spaces that are used by the public can affect the significance of noise and odour risks.	• Ordnance Survey Maps or Google Maps (or similar) http://bit.ly/28QIsCS
Services – electricity lines or gas pipes	The location of any gas pipelines or electricity cables can constrain the site design and layout. These should be investigated as part of the project viability assessment.	• Contact specialist service checker companies

Preliminary Assessment

UNDERSTAND THE SITE SETTING		
Consideration	**What does this mean?**	**Recommended sources**
Landscape designations	The location of the site within or near to an area designated for landscape reasons (such as an Area of Outstanding Natural Beauty) can significantly impact on planning feasibility and the site design that is acceptable may be affected by this.	• Natural England http://bit.ly/1CpbSB7 • Northern Ireland Department of Agriculture, Environment and Rural Affairs - Land and Landscapes http://bit.ly/28WeCfb • Natural Resources Wales Maps http://bit.ly/28M11X0 • Scottish Natural Heritage http://bit.ly/28Wf0tX
Protected or sensitive wildlife habitats	The presence of protected habitats, such as Sites of Special Scientific Interest (SSSIs), Ramsar Sites, Special Protection Areas (SPAs) or Special Areas of Conservation (SACs) indicate that an area is of international ecological importance. There are also national designations, such as National Nature Reserves and Local Nature Reserves. It is important to understand the ecological sensitivity of the site and its surroundings, as knowing the location of sensitive receptors will inform planning, permitting, project feasibility and risk levels.	• Natural England http://bit.ly/1CpbSB7 • Natural Resources Wales Maps http://bit.ly/28M11X0 • Northern Ireland Department of Agriculture, Environment and Rural Affairs - Biodiversity http://bit.ly/28NfHaW • Scottish Natural Heritage http://bit.ly/28Wf0tX
Watercourses and other surface water	As the operation of many AD plants involves the storage of large volumes of potentially polluting liquid and sludges, the potential for these to reach watercourses in the event of a spill or leak is likely to be relatively high where they are nearby, downslope from the AD site, and there are no man-made or natural physical barriers that would prevent liquid/sludge flow to them. The proximity of watercourses may affect the design measures that need to be in place.	• Environment Agency's What's in your backyard? http://bit.ly/1RfZN7k • Natural Resources Wales Maps http://bit.ly/28M11X0 • Northern Ireland Department of Agriculture, Environment and Rural Affairs – Water http://bit.ly/28NwDuo • SEPA's Interactive Map http://bit.ly/28Ngj0j
Groundwater sensitivity	Groundwater quality may be at risk should there be a leak or spill of digestate, oils or other liquids that may be stored on site.	• Environment Agency's What's in your backyard? http://bit.ly/1RfZN7k • SEPA's Groundwater Protection webpage http://bit.ly/28P2dvl
Nitrate Vulnerable Zones	A key part of running an AD plant is ensuring that there is a suitable outlet for the digestate produced. Ideally, this will be identified at an early stage, and this is certainly possible at farm based AD projects that will involve digestate spreading within the same farm. The spreading of digestate within Nitrate Vulnerable Zones (NVZs) is restricted during certain times of the year to prevent agricultural nitrate pollution, so if the spreading location is known it is recommended that the developer checks whether it is in an NVZ.	• Environment Agency's What's in your backyard? http://bit.ly/1RfZN7k • Natural Resources Wales Maps http://bit.ly/28M11X0 • Northern Ireland Department of Agriculture, Environment and Rural Affairs – Water http://bit.ly/28NwDuo • SEPA's Interactive Map http://bit.ly/28Ngj0j

UNDERSTAND THE SITE SETTING		
Consideration	**What does this mean?**	**Recommended sources**
Permitting Requirements Waste plants only	The site setting, type of feedstock and size of the proposed plant will affect the type of permit that is required. Some types of permits include requirements that influence site design. Getting in touch with the regulator's local area team is recommended as they can provide guidance and advice at an early stage. Contact should be maintained throughout the project.	• England- Environment Agency http://bit.ly/28NtGv7 • Wales – Natural Resources Wales http://bit.ly/28M8R2y • Scotland - SEPA http://bit.ly/28NxDyR • Northern Ireland - NIEA http://bit.ly/28Ng2sx • See ADBA Member Directory to find a permitting consultant
Planning Requirements	When developing a new site or making changes to an existing facility it is necessary to understand whether planning permission is required for the proposed development. This may influence the design decisions and the feasibility of the project so should be considered at an early stage.	• Check with the Local Planning Authority • See ADBA Member Directory to find a planning consultant
Animal By-products Regulations Requirements	The APBR have significant implications for AD plants that use animal by-products, in particular for pre-treatment requirements, temperature requirements and pasteurisation requirements. The regulations also require a Hazard Analysis and Critical Control Points (HACCP) plan to be put in place (see Managing Operational Risks, in this document).	• Animal and Plant Health Agency website
Insurance Requirements	Talking to an insurer or an insurance broker at an early stage in the project development can allow the developer to understand their minimum requirements in terms of risk management. Often, insurers are approached too late for there to be useful discussions that can improve the site design and reduce the site's insurance premium.	• ADBA Member Directory for a list of insurance organisations (under Service Providers)
Grid connection	To understand the proximity of grid connection, contact the relevant Grid Distribution Network or Distribution Network Operator. Also sensible to seek advice of specialist consultants or legal experts.	• Gas grid: visit Ofgem's website for more on Gas Distribution Networks. • Electricity grid: visit Ofgem's website for more on Distribution Network Operators. • See Members Directory for a list of consultants and legal experts

Preliminary Assessment

☐ THINK ABOUT THE SITE LAYOUT

Why is this important?

A common problem experienced by the industry is difficulty in accessing parts of the plant for routine maintenance. This can lead to unnecessary risks to the workers and contractors who undertake these tasks (which are essential to the safe, compliant and efficient running of the plant). Thinking through the possible site layouts and sizes of plant that will fit in the space available is vital. This allows the developer to optimise the return on investment while ensuring that environmental and health and safety risks are managed.

What should developers do?

Consider more than one layout/plant design and obtain independent expert advice on the pros and cons of different designs. It is recommended that advice is obtained from a range of sources – ask an insurer or insurance broker what they will be looking for, ask a local planning officer or planning consultant to advise on planning feasibility, and ask the local environmental regulator (e.g. the EA) or permitting consultant to advise on any of their requirements.

The developer should allow for occasional emptying and cleaning out of the digester and any other tanks that might accumulate grit and physical contaminants that sink to the bottom. Access to the relevant tanks by vehicles and machinery needs consideration at design stage.

It is recommended that the key considerations are:

- What size of plant is proposed?
- Is the site big enough to accommodate the proposed plant?
- What access is needed for maintenance of different parts of the plant?
- What type of secondary containment will be needed (such as bunding) and will this affect the rest of the layout?
- Will there be sufficient space for safe vehicle access to the site?

☐ ENSURE COMPETENCE

Why is this important?

The Health and Safety Executive (HSE), who regulate occupational health and safety, define competence as 'the combination of training, skills, experience and knowledge that a person has and their ability to apply them to perform a task safely'. This is different to 'technical competence' which is generally refers to a formal scheme. It is clearly vital that all site workers have the competence required to undertake their roles safely, for their own protection and the protection of their co-workers.

Sites that are permitted under the Environmental Permitting Regulations will have to meet the technical competence requirements of that permit; these should be made clear by the permit itself and advice can be obtained from the regulator (e.g. Environment Agency) or from the body that oversees the relevant qualifications (such as WAMITAB).

What should developers do?

Decision makers should first consider their own competency and assess the consequences and risks involved in their decisions as it will affect the operator's ability to ensure efficient and safe operational performance.

Developers should think about the employees and contractors needed to build and run the plant, as this will affect the required Capital Expenditure (CAPEX) and Operating Expenditure (OPEX). By considering this at an early stage, it also allows sufficient lead time to consider how best to find the required employees with the necessary skills and competencies. If it is not possible to find staff who are already trained, then it is sensible to consider what training will be required, how much this will cost and when it will be needed.

- Have you reviewed the 'AD Competency and Skills Matrix'?
- Will you have the required technical competence to operate the plant? If not, who will you appoint?
- How many staff will you need to safely operate your plant and what level of training do they need?
- How much will it cost to ensure ongoing training needs are met?

Find out more

- AD Competency and Skills Matrix http://bit.ly/28MsRnD
- Practical Guide to AD: Training http://bit.ly/28Ky38L
- ADBA Training, Safety and Environment Working Group's Secondary Containment at AD plants: An Industry Guide

☐ DISCUSS LEGAL AND CONTRACTUAL ARRANGEMENTS

Why is this important?

Considering the necessary contractual arrangements and discussing these with a lawyer at the project concept stage is important to protect the project and developer. The project should also be discussed with an insurer or insurance broker at this point. By investing in legal advice at an early stage, this can help the project run smoothly; it is often more costly and time-consuming to put in place contracts at the last minute than working on these throughout the project.

A legal expert can assist in the identification of the required contracts and put together a strategy for putting these in place. It is important to make all requirements clear to potential contractors at this stage.

Contracts are typically required by both funders and insurers, so without them it is likely to be impossible to get money and insurance needed to progress the construction of the plant. This can cause obvious delays in the plant development.

What should developers do?

Developers should approach their lawyer and discuss the various contractual requirements that will need to be in place and associated timescales. It is also advisable to identify the specific requirements needed to secure funding and insurance, and at what stage in the project these will need to be provided to the relevant parties.

Find out more

- Practical Guide: Legal and contractual matters http://bit.ly/28TI4B7
- Member Directory: Service Providers - Lawyers http://adbioresources.org/member-directory

CONSTRUCTION

The risks to the environment and health and safety during the construction phase of an AD project are mostly risks that are generic to the wider construction industry.

Health and Safety

Here we identify the main legal requirements that must be complied with, that relate to both general risks (the CDM regulations) and specific risks (working at height and working in confined spaces). Although we have listed them here under 'Construction', all of the regulations apply throughout the construction and the operation of the plant if relevant activities are undertaken. This is not an exhaustive list and all relevant health and safety legislation must be complied with.

☐ COMPLY WITH CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS

Why is this important?

Compliance with relevant legislation should be considered an absolute minimum in terms of health and safety management.

The primary piece of legislation relating to the management of health and safety risks during construction are the Construction (Design and Management) Regulations, known as the CDM Regulations. Due to the nature and complexity of AD plants, all projects will inevitably come under these regulations. Further to this, AD plants will very likely need to be notified to the HSE as construction will involve more than 30 days or 500 person days. As a result, responsibilities under the regulations will be placed on the client, the Principal Designer, the designers, principal contractor and other contractors. The Principal Designer should be appointed before design (including the site layout) commences.

The purpose of the CDM regulations is to integrate health and safety into the management of the project and to encourage everyone involved to work together to:

- Improve the planning and management of projects from the very start;
- Identify hazards early on, so they can be eliminated or reduced to an acceptably low level at the design or planning stage and the remaining risks are properly managed;
- Target effort where it can do the most good in terms of health and safety; and
- Discourage unnecessary bureaucracy.

The regulations are intended to focus attention on planning and management throughout construction projects, from design concept onwards. The aim is for health and safety considerations to be treated as an essential but normal part of a project's development, not an after-thought. Therefore, the designer is in a unique position to design out or mitigate risk.

What should a contractor or developer do?

Ideally from the design stage onward, and certainly prior to commencing construction, all parties should ensure that they are aware of their duties under the CDM Regulations, as shown on the relevant section of the HSE's website (see references section). They should then take steps to ensure that they comply with these duties. Failure to do this risks legal action being taken against the contractor or developer.

If any changes are made to the plant once it is operational, check the requirements of the CDM Regulations and ensure compliance with these.

Find out more

- HSE – Construction (Design and Management) Regulations http://bit.ly/1P30hM7
- Practical Guide to AD: Health and Safety Awareness http://bit.ly/28Nzc0K

Construction

☐ COMPLY WITH WORK AT HEIGHT REGULATIONS

Why is this important?

Working at height poses obvious health and safety risks, which must be managed in accordance with the Work at Height Regulations. During construction, working at height may be undertaken routinely and regularly and it is vital that suitable risk assessment and management is undertaken to protect workers.

What should the contractor or developer do?

The contractor or developer must ensure that they are aware of their duties under the Working at Height Regulations. Working at height is defined as work in any place (including a place at ground level, or below ground level) from which a person could fall and where the fall is liable to cause personal injury. If there is a significant risk of injury, action must be taken to manage this risk; the nature and extent of action required increases as the significance of the level of risk and/or the significance of the possible injury increases.

The hierarchy for safe working at height is as follows:

1. **Avoid the risk by not working at height** – where it is reasonably practicable to carry out the work safely other than at height, do so.
2. **Prevent falls** – where it is not reasonably practicable to avoid work at height, the level of risk should be assessed and measures introduced to allow the work to be done whilst preventing people or objects falling. This might include ensuring the work is carried out safely from an existing place of work or choosing the right equipment to prevent falls, such as a Mobile Elevated Working Platform (MEWP).
3. **Mitigate consequences of falls** – where the risk of people or objects falling remains, steps should be taken to minimise the distance and consequences of such falls. This also involves the selection and use of work equipment such as harnesses and lanyards.

These regulations will remain relevant whenever work is undertaken at height; the operator must ensure ongoing compliance with the applicable requirements.

The developer should challenge the designer to make sure that there is safe access for all routine maintenance tasks.

Find out more

- HSE – Work at height http://bit.ly/1F6ZCF3
- Practical Guide to AD: Health and Safety Awareness http://bit.ly/28Nzc0K

☐ HAVE A SITE TRAFFIC PLAN

Why is this important?

Vehicle movements within a site during construction and operation represent a significant risk to the safety of site workers and visitors. Collisions can cause serious injury and even fatalities.

What should a contractor or developer do?

Put in place plans to ensure that the risks are managed appropriately and put in place measures including (but not limited to):

- Having designated, clearly marked routes through the site.
- Enforced speed limits (e.g. 10mph).
- Site inductions and staff training in safe driving within the site.
- Ensure vehicles are maintained in accordance with manufacturers' requirements and are fit for purpose.
- Manage contractors on site, ensuring they are appropriately briefed on site procedures and are supervised when needed.

Find out more

- HSE's webpage on vehicles in the workplace http://bit.ly/28PpDBX

Construction

☐ COMPLY WITH CONFINED SPACES REGULATIONS

Why is this important?

During construction it may be necessary for a site worker to enter a confined space, and it may also be necessary during maintenance of an operational AD plant. Compliance with the Confined Spaces Regulations 1997 is required when this type of work is undertaken.

What should a contractor or developer do?

The contractor or developer should identify the risk assessments and actions required under the Confined Spaces Regulations. Confined spaces can be any enclosed area or space where there is a reasonably foreseeable specified risk associated with that space or area, and includes: storage tanks, boilers, pipes, drains, grain silos, construction voids and so on. The contractor or developer should assess the tasks required to complete the construction project, and identify the potential for working in confined spaces. They should then assess the risks, with consideration of all foreseeable hazards and risks, which can include: oxygen deficiency, toxic gases, fumes or vapour (e.g. hydrogen sulphide, methane, carbon monoxide and carbon dioxide) and slips, trips and falls.

Water UK's Confined Space Management Group developed an approach centred upon four standardised National Classifications for confined space entries, based upon a risk rating. The group published the 'Occasional Guidance Note – The Classification and Management of Confined Space Entries'. The document sets out nationally agreed minimum standards of management and operational performance, equipment and competence to be achieved by contractors. It is recommended that the developer or contractor refers to this guidance note as well as the HSE's guidance on confined spaces (both listed below).

Working in confined spaces may be required while the plant is operational, so the operator must ensure that there is ongoing compliance with the regulations.

Find out more

- HSE – Confined Spaces http://bit.ly/28Nn68N
- Practical Guide to AD: Health and Safety Awareness http://bit.ly/28Nzc0K
- Water UK Confined Spaces guidance http://bit.ly/28R2ttc

☐ COMPLY WITH ATEX/DSEAR REQUIREMENTS

Why is this important?

The requirements of the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) apply to workplaces where a potentially explosive atmosphere may occur. DSEAR translates the requirements of the European Directive on explosive atmospheres (referred to as ATEX) into UK law. DSEAR requires employers to control the risks to safety from fire, explosions and substances corrosive to metals. Plant owner/operator must determine fire/explosion risks, implement control measures to remove or control risks, and implement controls to reduce the effects should an incident occur.

What should a contractor or developer do?

The developer should ensure that they have adequate controls in place to control the risk of explosions during construction and throughout the site's operation. If there is any uncertainty regarding the responsibilities of different parties involved in the construction process, the Health and Safety Executive should be consulted.

Find out more

- HSE - ATEX http://bit.ly/1qzfz3D
- HSE - DSEAR http://bit.ly/28PVDDW

Construction

☐ COMPLY WITH PLANNING PERMISSION CONDITIONS

Why is this important?

Compliance with the project's planning permission is important to ensure that there is a good relationship between the Local Planning Authority and the developer. Failure to comply may result in action against the developer, and work may be stopped until the necessary consent is obtained.

What should a contractor or developer do?

The contractor or developer should ensure that they are fully aware of the planning permission that is in place, including the approved plant design and any conditions relating to the construction.

Depending on the size of the plant, an Environmental Impact Assessment (EIA) may be required to be submitted to the Local Planning Authority as part of the planning application. The production of this document would include assessing the environmental risks of the construction and identification of how these risks will be mitigated. In addition, the planning consent may contain conditions relating to the management of environmental impacts and these should be adhered to.

Find out more

- Practical Guide to AD: Planning http://bit.ly/28Mf8LI
- Contact a Planning Consultant – see our Member Directory http://adbioresources.org/member-directory

☐ ENSURE CONSTRUCTION COMPLIES WITH ENVIRONMENTAL PERMITTING

Why is this important?

AD plants that use waste feedstocks will fall within the scope of the Environmental Permitting Regulations (or equivalent); some of these will be required to operate under Environmental Permits but others (such as very small-scale plants may be exempt). The developer must check how the plant will be regulated at an early stage; a consultant can assist with this process (see our Member Directory for a list of consultants).

Although an Environmental Permit regulates the operation of the AD plant rather than the construction, it is important to stay in touch with the relevant environmental regulator throughout the project; the Environment Agency recommends that applications for planning permission and Environmental Permits are dual-tracked, to ensure that the project meets the requirements of both. Securing planning permission does not necessarily mean that the plant design will satisfy the requirements of the environmental regulator, and vice versa. The environmental regulator will have a view on key parts of the site design, including stack height and secondary containment among others. It is important to understand their requirements before submitting a planning application; failing to do so is likely to have implications on the project's timescales and finances.

What should a contractor or developer do?

If possible, dual-tracking the planning application and permit application can be beneficial; clearly the planning permission would need to be in place prior to construction.

If the developer has decided not to dual-track the applications, it is highly recommended that they discuss the proposed design with the local environmental regulator to understand any requirements they will have for the plant design prior to submitting a planning application, such as those regarding biofilters, stacks, tanks, flares, etc. These requirements can vary depending on the site setting and proximity of sensitive receptors, so although there is guidance available on the regulators' websites it is advisable to hold project-specific discussions to understand the applicable requirements. A consultant can also provide assistance with these discussions.

Find out more

- Practical Guide to AD: Permitting http://bit.ly/28MO9xT
- Contact an Environmental Consultant – see our Member Directory http://bit.ly/28MisXp
- Regulator Websites:
    - England- Environment Agency http://bit.ly/28NtGv7
    - Wales – Natural Resources Wales http://bit.ly/28M8R2y
    - Scotland – Scottish Environment Protection Agency http://bit.ly/28NxDyR
    - Northern Ireland – Northern Ireland Environment Agency http://bit.ly/28Ng2sx

Managing Operational Risks

As previously stated, the operation of an AD plant is accompanied by a variety of risks to the environment and health and safety and procedures must be planned and carried out that eliminate each risk or reduce it to an acceptably low level. Managing these risks is also likely to contribute to better operational performance. The risks and legislation referred to in our section on 'Construction' will still be applicable when relevant activities are being undertaken during operation (e.g. working at height and working in confined spaces).

By the time the plant is up and running, the developer should have assessed all foreseeable risks and used this not only to inform the design but to develop, and implement, suitable and sufficient procedures to ensure the safe operation of the plant. However, risk management does not stop once the plant is commissioned: it should be embedded throughout the operational procedures that govern the day to day running of the plant.

Managing Operational Risk in a Framework

Here, we outline a framework approach to operational risk management and provide links to further information on each aspect. Implementing a framework approach simply brings together various plans and systems that are needed to control risks, cross-referencing when appropriate to avoid duplication and to promote a holistic approach. The framework in place will almost certainly vary from plant to plant and there may be differences in the components making up each site's system, but the overall methods are generally applicable. Each component is explained below the diagram.

Example Framework for Managing Operational Risk

(1) Environmental Management Systems

Environmental Management System (EMS) is a structured framework for managing an organisation's environmental impacts. The EMS should be a practical tool that helps the organisation to understand their impacts and manage them, as well as providing a framework that brings together procedures and assessments on various topics. Typically, the EMS should follow the cycle of 'Plan, Do, Check, Act', which promotes a system of continuous improvement.

Having a suitable EMS in place is a normal requirement at sites with Environmental Permits under the Environmental Permitting Regulations or Waste Management Licensing Regulations. The regulators of these may have particular requirements and guidance on what should be included, with a focus on environmental risk management. Many organisations have adopted or commenced the approach specified in national or international standards (such as ISO14001) which set requirements and a framework for systems to be externally assessed and certified. Adoption of these approaches can satisfy the requirements of the UK environmental regulators though it is important to cross-check requirements.

An EMS can include accident and incident response plans, such as spill response plans, and these plans can be used to train and educate staff on the appropriate action to take in such events. The EMS should be accessible to all staff and they should be made aware of their responsibilities under the EMS.

(1a) Quality Management Systems - a quality management system (QMS) is the set of processes or procedures in place to ensure that customer requirements are consistently met. At AD plants, the customers include the user of the biogas produced (i.e. the National Grid or electricity grid) and the digestate produced (i.e. a farmer or landowner). All site staff must be made aware of their duties under the QMS. The QMS could be completely separate from the site's other management systems or could be linked – it is up to the operator to determine how their systems work best for them. There are independent standards for QMS, including ISO9001, and some companies choose to comply with these standards.

(1b) Maintenance Plans – at an AD plant there will be a variety of items and infrastructure that must be inspected and maintained to ensure the plant continues to operate safely and in compliance with relevant legislation. The frequency of maintenance is likely to be driven by manufacturers' requirements and specifications within warranties; there may also be contracts in place that cover the Operation and Maintenance of key items of plant (such as a CHP engine).

(1c) Digestate Management Plan – managing the quality of digestate is a core part of operating any AD plant, and it can be helpful to have in place a digestate management plan. This can include all aspects of digestate – how to ensure quality, where it will be spread, any market requirements, the digestates regulatory status and any quality and quantity monitoring.

Find out more

- IEMA webpage on Management System Schemes and Standards http://ems.iema.net/schemesandstandards
- Environmental Management Systems standard – ISO14001 http://bit.ly/1KIvwsc
- Quality Management Systems standard – ISO9001 http://bit.ly/28PkpFF
- Environment Agency guidance on Environmental Management Systems http://bit.ly/28PkuZY

(2) Training and Competence Plan

Ensuring the ongoing competence of all those involved in running an AD plant is key to its success and effective risk management. It is recommended that every operator has in place a Training Plan that identifies the responsibilities and training needs of each role. The 'AD Competency and Skills Matrix' should help operators create this (see below); the matrix was developed by ADBA's Training, Safety and Environment Working Group alongside CIWM and is an indicative guide to the competency and skills required at an AD plant.

The Training Plan could be incorporated into the site's EMS or it could be a standalone document, but should focus on the level of competence, skills and qualifications that each employee should have in order to be aware of relevant issues and effectively carry out his/her duties.

Where an AD plant aims to produce waste-derived digestate that achieves product status, PAS 110 requirements include that 'each person whose duties affect digestate quality shall be trained, instructed and supervised commensurate with those duties, such that he/she is competent'. Refer to PAS110 for further info; it's 'Section 4.3' sets out requirements relating to communication, awareness, training and competence.

Find out more

- AD Competency and Skills Matrix http://bit.ly/28MsRnD
- Practical Guide to AD: Training http://bit.ly/28Ky38L
- ADQP and PAS110 http://bit.ly/28NktD0

Managing Operational Risks

(3) HAZOP study or similar risk identification technique

'HAZOP' stands for 'hazard and operability' study, and is a structured and systematic assessment of a process design that considers deviations of design intent and analyses the causes and the consequences. It applies to existing or planned processes, provided that design specifications and information are available. The objective of the study is to ensure the design is robust; that all safety, environmental and operability issues are identified; and that adequate controls are put in place. It can reduce safety and environmental risks during the operation of the plant. In simple terms, a HAZOP study simply considers all aspects of the plant design and operation and asks 'what if?' This allows the project team to think through all scenarios, whether the risks can be designed out or managed and what response plans need to be put in place. A similar process is followed in 'SWIFT' (Structured What-If Technique) which is a systematic technique for risk identification, though generally this is less detailed than a full HAZOP study.

HAZOP studies can be undertaken at any point, but can be particularly useful during design and before construction, and if any changes are to be made to operations. Ideally, in order to undertake a HAZOP study, the following documents/information should be available:

- Description of contracts (Civils, AD, Low voltage, High voltage, engine, odour, any other)
    - Name of contractor
    - Scope
- Layout of the plant
- Process Description
- Process Control Philosophy (also called Functional Specification)
- Mass and Energy Balance
- Flow Diagram
- Process and Instrumentation Diagrams (P&ID) for the plant including
    - AD process
    - Digestate drying (if applicable)
    - CHP (if applicable)
    - Flare
- Components List – Ideally identified with matching tags to those in the P&ID
- Pipework drawings
- Tank drawings
- Drainage Philosophy description and drawing
- ATEX drawings
- DSEAR assessment
- Earthing, lightning protection study
- Traffic movement assessment
- Lighting scheme

It is accepted that not all of the above information may be available to the developer/operator when the HAZOP study is undertaken, but it is emphasised that in order for the study to be most effective it is considered that the above is needed. The HAZOP study should be undertaken at the optimum point in the project to ensure that the findings can still have the necessary influence on the plant design and management systems; this may vary from project to project but should be as early as possible once the design principles are established and before construction.

Find out more

- Practical Guide for AD: Health and Safety Awareness http://bit.ly/28Q6D3Q
- HAZOP standard IEC 61882 http://bit.ly/28Mp1Jo
- HAZOP Guide to Best Practice (Crawley and Tyler), available at IChemE' s website: http://bit.ly/28PBvUc

(4) HACCP Plan

AD plants that accept and treat animal by-products as feedstocks must be operated in accordance with the Animal By-Products Regulations. A Hazard Analysis and Critical Control Point (HACCP) safety assessment will need to be implemented at these plants to identify hazards to human and animal health that could arise when storing and treating ABPs and using the resulting digestate, and how the associated risks can be controlled such that they are acceptably low. HACCP planning is a process that identifies, evaluates, and controls hazards which are significant for product safety. The HACCP plan should influence the Standard Operating Procedures (SOPs), that should cover the procedures that reflect the critical control points (CCPs) and critical limits (CLs) identified in the HACCP plan.

The recommended approach to HACCP planning is: identify risks/hazards; conduct a hazard analysis; determine the Critical Control Points (CCPs); establish critical limits; establish a system to monitor control of each CCP; establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control; document and record all procedures, corrective actions and verification results; establish procedures for verification, audit, and; review to confirm that HACCP is working effectively. SOPs should include work instructions for implementing all CCPs and CLs set in the HACCP plan.

Some guidance is also included in digestate product standard PAS110 – a HACCP is part of the standard.

Find out more

- FAO document: HACCP system and guidelines for its application http://bit.ly/28PoB8C
- Government guidance on Composting and Biogas (Anaerobic Digestion) of Animal By-Products in Approved Plants http://bit.ly/28PoEBj
- Organics Recycling Group course on HACCP in an AD context
- PAS110 'Specification for whole digestate, separated liquor and separated fibre derived from the anaerobic digestion of source-segregated biodegradable materials' http://bit.ly/28PoXMs
- Practical Guide to AD: Feedstocks http://bit.ly/28OARG7

(5) DSEAR and Fire Risk Assessment

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) require employers to control the risks to safety from fire, explosions and substances corrosive to metals. The operator must determine fire/explosion risks, implement control measures to remove or control risks, and implement controls to reduce the effects should an incident occur. DSEAR only considers normal operation and certain maintenance and foreseeable events.

There needs to be a safe system of work in place to control activities in hazardous areas – for example welding and grinding should not be allowed while there is the potential for a flammable gas cloud to occur; non-sparking tools should be used in that area.

Find out more

- Practical Guide for AD: Health and Safety Awareness http://bit.ly/28Q6D3Q
- HSE's guidance on DSEAR http://bit.ly/28PVDDW

(6) Health and Safety Risk Assessment, Policy and Practices

As part of managing the health and safety of an AD business, the risks in the workplace must be controlled. This involves risk assessment, i.e. assessing what, in your business, might cause harm to people and deciding what reasonable steps can be taken to prevent that harm.

Having in place a written Health and Safety Policy demonstrates the commitment of the organisation to protecting the welfare of its employees; if you have fewer than five employees you don't have to write down your health and safety policy and risk assessment, but it would be best practice to do this. The HSE have produced a simple guide and template to producing these policies, which can be accessed at their website (see references below). The emphasis is on simple, practical and effective steps that improve health and safety, rather than on producing long-winded or onerous documents.

Due to the nature of AD, each site should also have written working practices and safe systems of working that are specific to that site.

Find out more

- HSE's guide to Health and Safety Policies http://bit.ly/1e4wumP

(7) Emergency Response Plans

There should be written procedures for responding to emergencies and all staff should understand the actions to take in response to an emergency, in order to ensure their own safety, and that of their colleagues, site visitors and the general public. These procedures can be incorporated into the site's EMS and/or Health and Safety Policies.

Find out more

- HSE's guide to Emergency Proceduress http://bit.ly/28OSvKL

Best Practice in Risk Management

REFERENCES

- ADBA Best Practice Scheme: http://adbioresources.org/our-work/best-practice-scheme
- ADBA 'The Practical Guide to AD' (various chapters): http://adbioresources.org/members-area/the-practical-guide-to-ad
- ADBA Member Directory: http://adbioresources.org/member-directory
- ADBA Best Practice Checklist on Operational Performance: http://adbioresources.org/our-work/best-practice-scheme
- ADBA website: http://adbioresources.org
- AD Competency and Skills Matrix: http://adbioresources.org/library/working-group-documents
- British Standards Institution website on ISO9001 (Quality Management Systems): http://bit.ly/28PkpFF
- British Standards Institution website on ISO14001 (Environmental Management Systems): http://bit.ly/1KIvwsc
- Crawley and Tyler (2015) 'HAZOP Guide to Best Practice', 3rd ed.: http://bit.ly/28PBvUc
- Defra guidance on Animal By-products Regulations: www.gov.uk/government/publications/controls-on-animal-by-products
- Environment Agency (EA) Quality Protocol for Digestate (ADQP): http://bit.ly/28KwwP9
- Environment Agency (EA) H4 Guidance on Odour Management: http://bit.ly/28NmRve
- Environment Agency 'Environmental Permits': www.gov.uk/topic/environmental-management/environmental-permits
- Environment Agency 'Developing Environmental Management Systems': http://bit.ly/28PkuZY
- Environment Agency 'What's in your backyard?': http://apps.environment-agency.gov.uk/wiyby/
- Fertiliser Advisers Certification and Training Scheme (FACTS): www.basis-reg.co.uk/Schemes/FACTS/About-FACTS
- Food and Agriculture Organisation 'HACCP and guidelines for its application: www.fao.org/docrep/005/Y1579E/y1579e03.htm
- Google Maps: www.google.co.uk/maps
- HSE guide to ATEX: www.hse.gov.uk/fireandexplosion/atex.htm
- HSE guide to Confined Spaces: www.hse.gov.uk/confinedspace/
- HSE guide to Construction (Design and Maintenance) Regulations: www.hse.gov.uk/construction/cdm/2015/index.htm
- HSE guide to DSEAR: www.hse.gov.uk/fireandexplosion/dsear.htm
- HSE guide to Emergency Procedures: www.hse.gov.uk/toolbox/managing/emergency.htm
- HSE guide to Health and Safety Policies: www.hse.gov.uk/simple-health-safety/write.htm
- HSE guide to Vehicles in the Workplace: www.hse.gov.uk/workplacetransport/
- HSE guide to Working at Height: www.hse.gov.uk/toolbox/height.htm
- International Energy Agency (IEA) Bioenergy Brochure on Process Monitoring: http://bit.ly/1H44goj
- Institute of Environmental Management and Assessment (IEMA) Guidance on Management Systems: http://ems.iema.net/
- Local Planning Authority Finder (includes links to England, Wales, Scotland and Northern Ireland): http://bit.ly/1jUcCIE
- National Association of Agricultural Contractors (NAAC) website: www.naac.co.uk/SpreadingtoLand/
- Natural England 'MAGIC' interactive map: http://magic.defra.gov.uk/
- Natural Resources Wales 'Apply for a Permit': https://naturalresources.wales/apply-for-a-permit/?lang=en
- Natural Resources Wales Interactive Maps: https://naturalresources.wales/our-evidence-and-reports/maps/?lang=en
- Northern Ireland Department of Agriculture, Environment and Rural Affairs: www.daera-ni.gov.uk/topics/
- Northern Ireland Environment Agency website: www.doeni.gov.uk/
- Northern Ireland Flood Risk Maps: www.nidirect.gov.uk/articles/check-the-risk-of-flooding-in-your-area
- Ofgem 'Gas Distribution Networks': www.ofgem.gov.uk/gas/distribution-networks/gb-gas-distribution-network
- Ofgem 'Electricity Distribution Networks': www.ofgem.gov.uk/electricity/distribution-networks/gb-electricity-dist
- Ordnance Survey website: www.ordnancesurvey.co.uk/
- Organics Recycling Group 'Course on HACCP in AD': www.biogas.org.uk/
- Scottish Environment Protection Agency (SEPA) 'Authorisations and Permits': www.sepa.org.uk/regulations/authorisations-and-permits/
- Scottish Environment Protection Agency (SEPA) Flood Risk Map: www.sepa.org.uk/environment/water/flooding/flood-maps/
- Scottish Environment Protection Agency (SEPA) Position Statement on Classification of Outputs from Anaerobic Digestion: http://bit.ly/28KwHdg
- Scottish Natural Heritage 'Protected Areas': www.snh.gov.uk/protecting-scotlands-nature/protected-areas/
- Water UK The classification and management of confined space entries: http://bit.ly/28R2ttc
- WRAP Digestate and Compost Good Practice Guide: www.wrap.org.uk/content/digestate-and-compost-good-practice-guidance
- WRAP Digestate and Compost in Agriculture (DC-Agri) Project: http://bit.ly/1Ui6BCB
- WRAP BSI PAS110 Specification for Digestate: www.wrap.org.uk/content/bsi-pas-110-specification-digestate
- WRAP Renewable Fertiliser Matrix: www.wrap.org.uk/sites/files/wrap/WRAP_DC-Agri_Renewable_Fertiliser_Matrix.pdf