Perceptions of sewage sludge

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Abstract In Europe the agricultural reuse of sewage sludge is controlled by Directive but the combined forces of statutory regulation and "market" regulation have made the task of exploiting the scientifically recognised agricultural reuse benefits of sewage sludge arduous to achieve. The paper examines the factors that have influenced the perception of sewage sludge by the public in the UK and how public perception can be exploited in order to achieve regulatory change.

Keywords Agriculture; "safe sludge matrix"; sewage sludge; odour; public perception; regulation; waste

Introduction
There are probably few in the scientific community who would argue that sewage sludge should be viewed as an unwanted by-product of sewage treatment. Even the most cursory review of the literature pertaining to sewage sludge reveals that an enormous amount of research has gone into understanding and exploiting the benefits of reusing sludge and into better understanding any threat that its reuse may pose to human health and to the wider environment. In Europe and in the UK the reuse of sewage sludge on land is recognised by both Government and the Regulators to be the best practical environmental option, so why has the reuse of sewage sludge attracted a significant degree of interest and concern over recent years?

Background
The traditional way of addressing concern has been through scientific research leading to the development of appropriate technological solutions. A look back over recent years on the controls placed on sludge reuse shows that the results of better scientific understanding have been implemented via improved techniques and technologies which have reduced risks to both public health and the environment. Examples of this are the voluntary codes of practice that the UK water industry has adopted in which responsible sludge reuse techniques supplement the legislative requirements of the European Directive on sewage sludge reuse EEC (1986) and UK regulations on the use of sewage sludge in agriculture (1989).

In turn, each new risk is subjected to scientific scrutiny so that public health and the environment are continually accommodated. All this has taken place within a regulatory framework which has the polluter pays principle and the precautionary principle at heart. The main sewage sludge producers in the UK, the water industry, have been happy to engage in the scientific debate as the outlet to land is nearly always the most cost effective reuse or disposal route. The end users of the sludge, primarily farmers, have been happy to accept the product as it is a free and readily available supply of nitrogen and other nutrients that they would otherwise have to purchase. The regulator has exercised control on the reuse activity through direct regulation, and until recently the public have had little reason to show any disquiet or exercise their prerogative to be kept informed.

However, it is often the case that even a seemingly ordered state of affairs can be upset by unforeseen and unlegislated circumstances. Such has been the case with sludge reuse which has, consequently attracted a significant degree of interest in recent years.
Public health scares

BSE (Bovine Spongiform Encephalopathy) or mad cow disease as it has come to be known was a huge blow to public confidence in UK farming practice. People were contracting the human form of the disease through no fault of their own, from food that everyone believed to be safe. What is more, the BSE health scare came on top of earlier public outrage over outbreaks of salmonella poisoning in humans, attributed to poor practice in the poultry farming industry. If disease could be contracted by humans via the direct food chain then how else might it be transmitted, and what other farming practices might be called into question? What other food scares were waiting round the corner?

These concerns generated interest in sewage sludge practices and focused attention on the potential for the agricultural reuse of sludge to become the next major health scare.

At the time of the BSE crisis, concerns about pathogens in sludge applied to land had already been highlighted. In the UK, a report in February 1996 from the Royal Commission on Environmental Pollution on the Sustainable Use of Soil made it clear, amongst other things, that the commission believed:

- there was an unacceptable risk to human health of infection from pathogens
- the amount of heavy metals and persistent organic compounds was too high
- the use of untreated sewage sludge on agricultural land should be phased out.

In a follow up press release on May 8th 1996, three months after the issue of the Report, a House of Commons Committee stated:

“The Royal Commission remains concerned that the potential hazards represented by pathogens in wastes have received too little attention. Its recent report on Sustainable Use of Soil discusses in particular the parasite Cryptosporidium, sewage sludge, and other types of waste which can be spread on land without a waste management licence. One recommendation was that all sewage sludge applied to agricultural land should be treated. Another was that the Environment and Agriculture Departments review immediately the present legislation governing the spreading of wastes on land, with the aim of improving control and making regulation of the application of all wastes to land more consistent.”

The press release indicates that the UK Government was being put under pressure to make changes to the rules, not only in respect to sewage sludge but also with regard to the use of other wastes on land. In response they promised a review of all waste disposal to land. However, towards the end of the following year (1997) nothing had appeared and another player entered the scene when the UK food retail industry joined the debate.

The food retail industry, in light of the strong backlash of public opinion to the salmonella and BSE health scares, was likely to have been concerned that the pace of legislative change in respect to the use of sewage sludge was far too slow. They may well have felt that it exposed them to an unacceptably high risk that food grown on land treated with sewage sludge would provide the basis for the next health scare and, notwithstanding the public health issues, would put their industry and profits under threat.

In late 1997 a number of the large supermarket chains, an influential segment of the food retail industry in the UK, began to apply pressure of their own by following the lead taken by retailers in Sweden and Germany where they had achieved a virtual ban on sludge use in agriculture.

The food retailers took the debate straight to the major sludge producers i.e. the UK water industry. They informed water companies that they were now reviewing the use of sewage sludge on land. The methods the food retailers would use to achieve the most dramatic shake up in the practice of sludge reuse that the UK water industry has ever experienced have been extraordinary in their effectiveness.
With the introduction of the retailers into the game the biggest fear for the water industry was that the retailers would instruct their food growers not to accept sewage sludge for application to agricultural land. The water industry realised that the knock on effects of this instruction could quickly become far reaching. Land owners who were not under the influence of the retailers would inevitably be tempted to turn their back on sewage sludge for fear of having their land viewed as substandard or contaminated. For the UK water industry, which at the time was reliant on the agricultural outlet for 50% of its sludge production, the risk this threat posed was sufficient to put them into immediate talks with the retailers.

**Exploitation of perceived public perception**

The speed at which things then began to happen was quite amazing. By February 1998, just a few months after entering the debate, the retailers had achieved the basis for agreement with the water industry via the first proposal relating to what is now known as the “safe sludge matrix” (see Addendum). Over the following months the proposal was developed with the involvement of Government and the regulators. By June 1998 the Government was promising changes to regulations in line with the “safe sludge matrix” approach, and the Economic Regulator was receptive to water industry claims that the cost of the necessary infrastructure and operational changes would be in the order of £284 million (ENDS Report 1998).

In 1999 the UK water industry voluntarily agreed to a phased implementation of the “safe sludge matrix” even though new regulations giving it force of law were not expected until January 2002. Quite a remarkable success for the food retailers, one would have to agree, but some might argue that it was success achieved on false arguments.

In reviewing the events leading up to the implementation of the “safe sludge matrix”, the emphasis has been on a concern for public health, and, with the BSE crisis still fresh in people’s minds, the extrapolated inference is that public outcry is just round the corner, but is this true? Is it not more reasonable to say that the potential threat of public outcry has been exploited in order to trigger a reaction?

However, a reaction will only be triggered with the help of another player in the game. This player is the media and it is the media who put these perceived public concerns into print where they become accepted as reality. Using the media as a vehicle, clever exploitation of perceived public perception becomes a powerful tool for those who feel that the pace of change, or the advancement of science, is too slow to accommodate their fears or achieve their objectives. Is this an unexpected application of the precautionary principle, or a deliberate manipulation of the facts? Whichever, the food retail industry used this strategy to great effect in generating the perception of public concern and this has a great deal to with why the reuse of sewage sludge has attracted a significant degree of and concern interest over recent years.

**Results of scientific research**

In 1998, while this interest was at its height, WRc published a report (WRc, 1998) which had been commissioned jointly by Government and the UK water industry in response to the Royal Commission’s finding of 1996.

The reports findings were somewhat of a mixed bag. It provided support for the food retailers lobby in that some of the measures within the “safe sludge matrix” were advocated e.g. the phasing out of untreated sludge to land and the introduction of regulatory controls to sludge treatment processes. However, the report also provided support for existing practices e.g. it concluded that the existing multiple barrier approach (controlling land use, crop types and harvesting times etc.) to preventing the entry of pathogens into the human food chain was based on sound science.
The report also brought out the incongruity between the controls placed on the application of sewage sludge to land and the lack of control on the application of other wastes to land.

Although the figures provided in the WRc report of 1998 on the quantities of waste spread on land were estimates, they certainly bring into question whether or not regulatory effort is being applied in the right place. The report acknowledges that farm animal waste does present many of the same risks to human health as sewage sludge, and it concludes that many of the measures employed in the safe use of sewage sludge would work equally well if applied to the reuse of animal waste. The figures, reproduced in Table 1 below, show that the quantity of sewage sludge spread on land is tiny (2%) when compared to the quantity of farm animal waste, and minute when compared to the total amount of all other waste spread on land.

What makes this comparison so worthy of note is that in the UK farm animal waste is excluded from the regulations controlling the spreading of waste on land. The controls on farm animal waste are all voluntary in the form of Codes of Practice. Compare this with the controls placed on the application of sewage sludge to land where European Directive, UK Regulations, Codes of Practice and now the “safe sludge matrix” all have to be complied with, and the absurdity of the mismatch in legislative control becomes evident. All the regulatory effort is directed at 2% of the problem.

Even after the publication of the 1998 report the focus for regulatory control has continued to be on the 2% i.e. sewage sludge, and two measures in particular provide ample demonstration.

The first is the enshrining of the “safe sludge matrix” in legislation. The second is a proposal by the UK Government to amend current regulation to bring the 2% (sewage sludge) under even greater regulatory control by categorising sewage sludge used in agriculture as a “waste” rather than a useful resource. This would add another layer of regulation, in the form of the Waste Framework Directive, to what is already felt by those in the water industry, and hopefully demonstrated by this paper, to be an overregulated activity.

Placing the label of “waste” on sewage sludge can only be seen as a backward step which

<table>
<thead>
<tr>
<th>Origin of waste</th>
<th>Quantity (tonnes × 10^3 dry weight)</th>
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<tbody>
<tr>
<td>Farm animal</td>
<td>21,000</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>430</td>
</tr>
<tr>
<td>Paper industry</td>
<td>520</td>
</tr>
<tr>
<td>Food industry</td>
<td>600</td>
</tr>
<tr>
<td>Sugar industry</td>
<td>200</td>
</tr>
<tr>
<td>Vegetable and food processing</td>
<td>70</td>
</tr>
<tr>
<td>Textile industry</td>
<td>22</td>
</tr>
<tr>
<td>Water treatment</td>
<td>17</td>
</tr>
<tr>
<td>Meat processing (blood etc. from abattoirs)</td>
<td>15</td>
</tr>
<tr>
<td>Beverage production (breweries, soft drinks)</td>
<td>11</td>
</tr>
<tr>
<td>Dairy industry</td>
<td>7</td>
</tr>
<tr>
<td>Leather tannery</td>
<td>1</td>
</tr>
<tr>
<td>Septic tank sludge</td>
<td>*</td>
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<tr>
<td>Biological treatment plant sludge</td>
<td>*</td>
</tr>
<tr>
<td>Waste wood, bark or plant</td>
<td>*</td>
</tr>
<tr>
<td>Waste soil</td>
<td>*</td>
</tr>
<tr>
<td>Dredgings from inland waters</td>
<td>&gt;500 000*</td>
</tr>
<tr>
<td>Lime, cement industries</td>
<td>&gt;500 000*</td>
</tr>
<tr>
<td>Compost</td>
<td>~600 000*</td>
</tr>
</tbody>
</table>

* – reliable data not available, figures in italics are crude estimates and expressed as wet weight (WRc 1998)
flies in the face of the “safe sludge matrix” approach which is aimed at building confidence in the reuse of a scientifically demonstrated useful resource. The water industry might feel justifiably angry that they have agreed to a radical change in their approach to the use of sludge in agriculture, incurring significant expenditure of the public’s money, only to find that the product, the sludge, may be labelled as something undesirable i.e. a waste. At the time of writing this paper the water industry is hopeful that Government will pull back from implementing this legislative change.

However, legislative changes are in store for the European Sludge Directive. It is likely that additional waste types will fall within the Directive’s scope, but the chances of the inclusion of farm animal waste are slim. Without direction from Europe it is very doubtful that the UK Government will ever voluntarily choose to add such a contentious waste stream into regulatory control. The revision of the Directive is, however, likely to take it closer to the “safe sludge matrix” approach with its focus on treatment standards and pathogen kill (IWA Specialist Group on Sludge Management). Perhaps this provides some crumb of comfort for the UK water industry in that their financial expenditure, initiated by retail/market pressures, will eventually be justified by European regulatory sanction.

The influence of odour

Labelling sewage sludge as “waste” is likely to hold back any improvement in public opinion, but what is the public’s perception at the moment? It is conjectured that there is another factor which influences public perception of sewage sludge reuse to a far greater extent than anything discussed in this paper so far, and that factor is odour.

Very seldom does a member of the public register concern or complaint about sewage sludge reuse solely due to a fear relating to food safety; they have usually been provoked to complain by having their privacy invaded by odour from a sludge spreading activity close by. Only when they have been personally affected will they voice any concern and odour is the most likely catalyst. When something smells bad enough to give people cause to complain then it is only a short step before they begin to question the merits of the activity creating the odour and whether or not such an activity can possibly be healthy!

One feasible inference from the above is that if sewage sludge did not smell the public would not complain and the overall public perception of the reuse of sewage sludge would improve. However, it is very unlikely that had the water industry tackled the odour issue years ago there would now be no need for the “safe sludge matrix”.

This paper has shown that there is a difference between what the public really feels and what they are perceived by the media to feel, and it is the power of perceived public perception that carries the weight. Therefore threat of public outcry was always going to be available to the food retailers in their campaign for tighter controls even if there had never been a single complaint from the public.

Using sewage sludge for nonagricultural purposes

The use of sewage sludge for nonagricultural purposes is well established even though this reuse must satisfy the regulatory controls of the waste management regime. Sewage sludge cake is used frequently in land restoration projects and other outlets such as composting and coppicing are beginning to gain a foothold.

Once again one of the factors that can have a detrimental effect on the public perception of these nonagricultural activities is odour, but unlike the Directive on sewage sludge reuse, the Waste Directive imposes clear rules on the control of odour, yet the nonagricultural outlets for sewage sludge are holding their own. However, it is unlikely that nonagricultural outlets for water industry sludge would ever prevail. Agricultural land applications have the advantage in that crop uptake of nutrients leads to the potential for further applications
of sludge in subsequent years, whereas reclamation sites are transient in that once they have been restored they are unlikely to have a further need for sludge in subsequent years.

It is interesting to speculate whether or not these types of nonagricultural reuses of sludge are more acceptable to the public due to the fact that the sludge is being regulated as waste, which is what they perceive it to be. However, odour is always likely to have the upper hand in that no matter which regulatory regime is in operation, if sludge smells bad it will create complaint and therefore be more likely to trigger other concerns, but there is another tool that can be employed to good use in minimising concern.

The public want to be kept informed and this appetite for information can be used to good advantage. Experience has shown that if those who are likely to have their privacy invaded by a sludge spreading operation are informed about the activity they are far more likely to be tolerant, and even supportive, if they have had their questions and concerns addressed in advance of the activity starting. Sometimes it is not odour that is of concern, but associated activities such as an increase in vehicle movements, or noise from machinery and equipment etc.

The UK water industry has recognised the need to master the art of communication with the public if there is to be a genuine change in the way members of the public perceive reuse of sewage sludge. Whilst it is only to be expected that not everyone will be convinced there can be no doubt that better communication is the key to improvement in public perception.

Conclusions

- This paper has conjectured that there are two types of public perception; one by individual members of the public who have had their privacy invaded due (primarily) to a sludge spreading activity that smells; and the other is the “perceived” public perception that appears in the media and is actually the views of others who are speaking from their point of view on behalf of the public.
- From the individual’s point of view the way to address the issues is straightforward, i.e. prevent the invasion of privacy by making sure that sludge reuse activities do not smell. However, odour is not always the only concern. Better communication with those directly affected is needed in order to address individuals’ concerns and thereby encourage a more favourable public perception of the activity.
- From the point of view of the other players in the game, players such as government and those who would speak on behalf the public, the way forward should be through scientific research leading to the development of appropriate technological solutions based on sound science. The assurance of sound science should then provide these groups with the confidence to declare the activity safe. However, the media will always provide a vehicle for those with sufficient motivation to exploit public opinion and portray “perceived” public opinion as reality for their own benefit.
- A comparison of regulatory controls placed on the use of sewage sludge on land with controls placed on the use of animal manures, reveals that all the regulatory effort is directed at sewage sludge which, in the UK, only represents only 2% of the total amount of animal manure applied to land. The conclusion is that sewage sludge is over regulated in comparison to animal manures.
- The “safe sludge matrix” approach has been chosen as the way forward for the continued use of sewage sludge in agriculture in the UK and the water industry in the UK will be doing its utmost to make sure that it is successful. However, the agricultural land outlet will always remain vulnerable to attack from “perceived” public perception and vulnerable to forces and events outside its control such as BSE and, more recently, the foot and mouth epidemic.
- Alongside the science which is to be found in the “safe sludge matrix” approach, the UK...
water industry will need to further develop its marketing and communication skills if it is to be successful in future debates on the safe use of sewage sludge with powerful bodies such as the food retailers. Next time the stakes are likely to be even higher, perhaps the calling for a complete ban on the application of sewage sludge to agricultural land.

- The only way to change the perception of individuals is through communication and the “safe sludge matrix” is likely to be a blessing in disguise for the water industry in this respect. For example, the treatment processes will, by their nature, produce sludge which is less likely to smell, and the quality control requirements will provide evidence of treatment efficiency when it comes to sensitive public concern parameters such as pathogens. This may provide some comfort for the water industry in that their uphill and expensive effort in meeting scientifically unjustified regulatory requirements may well bring them public perception benefits as a spin-off.

- However, the danger remains that the power of perceived public perception is likely to be sufficiently strong to overwhelm the voice of true public perception even if the water industry achieves success with the “safe sludge matrix” and significantly improves its marketing and communication skills.

Is the “safe sludge matrix” only a period of remission in the ultimate demise of the agricultural reuse of sewage sludge in the UK?

Acknowledgements

The author wishes to thank Mr Mohammed Saddiq, United Utilities, and Mr John Tyson for their assistance. The views expressed in this paper are those of the author and not necessarily those of United Utilities.

References


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ENDS Report 282 (July 1998) page 41 – Environmental Data Services Ltd.

WRc (1998) Review of the scientific evidence relating to the controls on the agricultural use of sewage sludge.


Addendum

The following is taken from the “safe sludge matrix” guidelines for the application of sewage sludge to agricultural land (www.adas.co.uk).

The “safe sludge matrix” consists of a table of crop types, together with clear guidance on the minimum acceptable level of treatment for any sewage sludge based product which may be applied to that crop or rotation.

Conventionally treated sludge means sewage sludge that has been subjected to defined treatment processes and standards that ensure at least 99% of pathogens have been destroyed. Enhanced treatment is a term used to describe treatment processes which are capable of virtually eliminating any pathogens which may be present in the original sludge. Enhanced treated sludge means sewage sludge that is free from Salmonella and will have been treated so as to ensure that 99.9999% pathogens have been destroyed (a 6 log reduction).

The use of raw or untreated sewage sludge use on agricultural land for food production is not permitted and neither is the surface spreading of conventionally treated sludge on grazed grassland. Conventionally treated sludge can only be applied to grazed grassland where it is deep injected into the soil and there will be no grazing or harvesting within three
weeks of application. Where grassland is reseeded, sludge must be ploughed down or deep injected into the soil. Conventionally treated sewage sludge can be applied to the surface of grassland or for forage crops such as maize, which will subsequently be harvested, but there can be NO grazing of that land within the season of application.

Vegetable crops – More stringent requirements apply where sludge is applied to land growing vegetable crops and in particular those crops that may be eaten raw (e.g. salad crops). Conventionally treated sludge can be applied to agricultural land which is used to grow vegetables in the rotation, provided that at least 12 months has elapsed between application and harvest of the following vegetable crop. Where the crop is a salad which might be eaten raw, the harvest interval must be at least 30 months. Where enhanced treated sludges are used, a 10 month harvest interval applies.