Disasters as Heuristics? A case study

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Introduction

During the early 1970s the members of a local environmental group in Port Talbot, South Wales began complaining about the environmental and health record of a local petrochemicals plant. It was alleged that the plant generated dust, noise and light pollution, and 'odours'. Concern was also expressed about the use of vinyl chloride monomer, a suspected carcinogen, as a feedstock gas. The plant's explosive hazards were not a major bone of contention.

On June 1, 1974, the Nypro nylon-manufacturing plant at Flixborough on Humberside exploded killing 28 workers. The deaths and property damage to local houses were widely reported. Following this event, the Port Talbot group began to focus on the potential explosive hazards generated by the petrochemicals plant.

This paper attempts to explain the changing risk perceptions of the Baglan Action Group (BAG) following the Flixborough disaster. Two discourses are employed: Kasperson's (1992) 'social amplification of risk' model, and the social psychological theory of heuristics (Rachlin 1989). The paper commences with a brief description of the two discourses. This is followed by a history of the petrochemicals plant at Port Talbot and a description of the Flixborough disaster. Case study data is presented, and some tentative conclusions drawn.

Discourses

'The Social Amplification of Risk' model

For Kasperson, our experience of risk has two dimensions: First, actual physical harm; Secondly, the acquisition or creation by individuals or groups of 'interpretations of hazards'. The 'social amplification' model focuses on the latter dynamic. Specifically it addresses the possibility that 'psychological, social, institutional, and cultural processes… can heighten or attenuate perceptions of risk and shape risk behaviour'. The 'social amplification' model is premised on the assumption that risk is part 'objective threat' and part a product of 'culture and social experience'. Not all risks are given equal attention. Receptivity is a function of currently held beliefs and agendas (Kasperson 1992):

> *Some groups and individuals actively monitor the experiential world, searching for hazard events related to their agenda of concern…[they] process the information [and] locate it in their agenda of concerns…Some may change their previously held beliefs… and be motivated to take action• [S]ignals that are inconsistent with previous beliefs or that contradict the person's values are often ignored or attenuated.*

Crucially, therefore, groups or individuals may amplify or attenuate risk 'signals'. As Kasperson (1992) puts it, 'Each cultural or social group selects certain risks and adds them to its strand of worry-beads…even as it selects out other risks'. Kasperson uses Rayner's 'electronic tuner' imagery to explain why some risk messages are picked up and others not. Thus according to Rayner and Kasperson people are 'pre-tuned' to pick up only certain kinds of messages. Kasperson elaborates by asserting that while 'most individuals are largely reactive…many organisations actively seek out and order risks'. The media plays an important role in amplification or attenuation processes. 'The processing of risk events by the media…profoundly shapes the societal experience with risk…Heavy media reporting appears to stimulate social mobilisation', says Kasperson. The media response is 'roughly proportional' to the physical consequences of the event, while risk perception 'appears to incorporate extent of human exposure as well as risk management performance'.

Heuristics

A heuristic is a mental shortcut that '…provides a simplifying routine… that leads to approximate solutions to… everyday problems' (Fiedler and Schmid; Hewstone 1996). In today's complex world it is sometimes difficult to come to a decision. There seems to be too much data to process in the available time. Such cognitive mechanisms as heuristics '…help the individual to save mental resources…and enables him or her to cope with multiple affordances at the same time' (Fiedler and Schmid; Hewstone 1996). Take the problem of deciding the safety of air travel. Rather than examine all available data, one might be tempted to calculate the safety of air travel on the basis of those events that come most easily to mind. Unfortunately, given the widespread and often detailed reporting of air disasters, one might decide that air travel is dangerous. High profile air disasters offer the public an 'availability heuristic'—a means of quickly estimating the safety of air transportation. Air disasters constitute a 'simplifying routine' for the processing of information and decision-taking. As Perrow (1984) puts it, 'If there has recently been an airline crash, we focus on that event and ignore all the successful flights when we think about the probability of a crash while deciding whether to take a flight or not'. Making a decision on the basis of a limited set of data (an easily recallable event, for example) is known as 'satisficing'. Ideally, of course, one should 'optimise'—that is, spend time and effort weighing up all available data before making a judgement. In the case of air travel, for example, this would mean availing oneself of transportation safety data. Given that air travel is three times safer than rail travel and thirteen times safer than car travel, one might well decide to go by air rather than by any other form of transport. But, as described above, there is a tendency to use mental short-cuts in decision-making. To save time and effort we allow ourselves to be influenced by such memorable and vivid events as disasters or the modes of death of the rich and famous. As Rachlin (1989) explains:

> *You are driving along the highway and see the flashing lights of police cars and ambulances… You drive a little slower for the next hour or so. You hear that… President Reagan has rectal cancer and you make an appointment with your own doctor. In making judgements as well as decisions we tend to use the information that is most available to us… It is of course easiest and fastest to make judgements on the basis of what*

is easiest to call to mind—the heuristic of availability.

The Port Talbot Plant

The petrochemicals plant in question was owned and operated by British Petroleum Chemicals International. Sited at Baglan Bay near the town of Port Talbot, it covered about 600 acres of a 1,000 acre site. BP built the plant in the 1960s, siting it adjacent to a low-rent housing estate of 15,000 people, (Jones 1989) a school with 1,700 pupils and a sports ground.

The school was situated about 500 yards from BP's perimeter fence. Work on the housing estate had commenced in 1950. The plant came 'on stream' in 1963. By 1968 it employed around 600 people. The company boasted of the plant's 'Space Age technology' that would'… help the Nation's Balance of Payments by eliminating imports'.(BP Chemicals International ad. 1968). BP completed a major addition to the plant in March, 1974, by which time it had invested a total of £140 million. The plant's incremental growth reflected a buoyant UK petrochemicals sector (Cranfield 1974). Petrochemicals plants present both fire and explosive hazards. The larger the plant and the greater the volume of on-site storage, the greater the risk (Napier 1974).

There had been two major fires at the Baglan Bay plant prior to the Flixborough disaster. On 6 February 1973, Baglan's new ethylene plant caught fire during commissioning. Flames 'soared 150ft above the works'. Fourteen workers were injured. In addition to works appliances, five municipal fire engines attended the scene. According to one newspaper (The Port Talbot Guardian, 9/2/1973) the local population seemed ignorant of the cause and nature of the problem:

Thousands of people on the Sandfields and Baglan Estates watched as columns of yellow flames belched skywards. Many believed the fire was all part of the commissioning work.

It emerged that the fire had been caused by a component failure that allowed 'large volumes of flammable hydrocarbon gases' to escape 'at high pressure' (The Port Talbot Guardian, 23/2/1973). There are similarities between this incident and the later Flixborough explosion, where a flammable mixture escaped under pressure (Kennett 1982). At Flixborough, however, the gas exploded with enormous force (see below).

At the end of February 1974 the styrene plant caught fire releasing a 'large quantity of smoke' which 'drifted like a huge pall across the nearby Sandfields Estate'. Eight municipal fire appliances attended the blaze, which burned for 35 minutes. The headmaster of the local school, on seeing the 'dense black pall', ordered that all the school's windows be closed (The Port Talbot Guardian, 1/3/1974).

By the end of 1977 the number of pollution-related complaints received by the plant had been greatly reduced (The Western Mail 24/11/1977), but the plant continued to suffer periodic fires. In March, 1983, a blast in the ethylene plant injured two workers, one severely. As The Western Mail reported on 10 March:

The blast…sent thick black smoke hundreds of feet into the air. The force of the explosion rattled windows up to three miles away. The blaze took two hours to bring under control…Thirteen fire appliances…including 10 water tenders, two foam units, a turntable tender [sic] and an emergency unit fought the blaze.

In October 1990 the ethylene plant again caught fire. It took 12 hours to bring the blaze under control.

Despite such obvious setbacks, however, during the 1990s Baglan Bay's local management made great efforts to involve the community more with the plant (Bennett 1996).

Baglan Action Group

BAG was formed in February 1974 in response to perceived inadequacies in BP's attitude to pollution. It had ten members. Initial concerns focused on '…the medical effects of industry on people'. While members were aware of the 'potentially explosive' (The Western Mail 19/2/1974) nature of BP's activities, until Flixborough this particular risk did not feature prominently in exchanges between BAG and BP Chemicals.

The Flixborough Disaster

The Nypro plant was located on mostly flat land between two villages, Flixborough and Amcotts. The site extended over 60 acres. The population could choose to work either at Nypro, a local steel plant or in agriculture. Although Nypro employed about 550 people, few Flixborough residents worked there (Clammer 1974). The plant produced Nylon-6 for the garment industry by combining benzene with ammonia. A Nypro chemist likened this process to 'boiling petrol' (Scullion

Map of the Port Talbot region surrounding and including the British Petroleum Chemicals International plant at Baglan Bay.

The British Petroleum Chemicals International plant at Baglan Bay, Port Talbot, South Wales in January 1993. Photographed from the western bank of the River Neath. The town of Port Talbot and the Sandfields Estate are located 'behind' the plant.

1974). Twenty-eight workers were killed and 36 injured in the disaster. Had the disaster not occurred at the weekend many more workers would have been killed (Taylor 1975). The plant exploded with a force of 'between 15 and 45 tons of TNT' (Kirkwood 1997). Some witnesses likened the event to an atomic explosion (Kennett 1982). A police report '…describe[d] an enormous black mushroom cloud laden with debris which rose to over a mile (1.6km) above the devastated area…Falling debris started small fires up to three miles (4.8km) away' (Kirkwood 1997). The main conflagration lasted 24 hours. Smaller explosions occurred throughout the following week. Three thousand local residents were evacuated. One thousand homes lying within a three mile radius were damaged.

Out of Flixborough's 79 houses, 72 were damaged (Brown 1990). There were 53 recorded casualties outside the perimeter fence. The disaster was covered in the media and discussed in Parliament. The local MP asserted that 'the cost in terms of grief and misery my constituents have had to suffer…is too high for a so-called civilised society to bear' (Ellis in the Times 1974).

Methodology

Secondary sources only have been used, specifically the reportage of three local newspapers, The Western Mail, The South Wales Echo ('sister' paper to the Mail) and The Port Talbot Guardian. The papers have been used to tell the history of the risk debate and as a source of 'witness statements'. The publication dates are given in parentheses.

It is accepted that this methodology is not optimal. Contemporary researcher-conducted interviews with protagonists and participant observation would have provided the most reliable data. Nevertheless, on the assumption that reporters recorded events and the views of group members accurately, the three secondary sources may be considered to provide a truthful account of the terms, nature and course of the risk debate.

The risk debate as reported by The Western Mail, Port Talbot Guardian and South Wales Echo

Prior to the Flixborough disaster, the risk debate pertaining to the BP Chemicals plant had two major themes: environmental pollution and the health risk to workers presented by vinyl chloride monomer (VCM). VCM had been linked to cancer of the liver. The pollution debate revolved around four aspects of the plant's operation: its alleged dust and odour emissions, light pollution and its generation of 'excessive' noise (Mail 15 February 1974). The Baglan Action Group—'Formed to fight pollution'—orchestrated the campaign against BP. As the leader of BAG put it:

> *Our complaints are well known. They are of smoke, noise and chemical pollutions [sic] and we are desperately anxious to have some early answers to our questions (Echo 19 February 1974).*

BAG worried that pollution would 'devalue property' (Mail 20 February 1974). 'It is BP that's devaluing the property' said the action group's Secretary in late February 1974 (Echo 20 February). In the same month a local councillor complained that 'the noise nuisance is as bad now as it was 12 months ago' (Guardian 22 February 1974).

Questions about BP's environmental performance had been raised prior to BAG's formation in 1974. On 19 September 1973 the Headmaster of the school adjacent to the site had 'complained to the Port Talbot public health inspectors office' about a pungent odour. Residents 'complained that the smell…made them feel drowsy and gave them a burning feeling in their throats'. A spokesman for BP stated that it was not certain the odour had come from the plant (Mail 21 September 1973).

Protest against BP's environmental performance took a number of forms. In September 1973 three residents on a local private housing estate held a rates strike (they refused to pay their property tax). One complained that pollution from the plant was affecting property values:

> *Our lives have become intolerable as a result of the noise and pollution coming from the BP plant over 14 months and which has continued despite complaints. When our rates were increased under the new assessments it was the last straw, because the conditions have reduced the value of our properties.*

Another rates striker complained about the 'inhuman' noise pollution produced by the plant (Guardian 21 September 1973).

At the beginning of 1974 The Western Mail reported that the deaths of three workers in America who had been exposed to VCM gas were being investigated. On 31 January, The Western Mail announced that 'Medical records of about 700 men at BP in South Wales are to be checked after it was found they have been in contact with [VCM]'.

The themes of environmental pollution and workers' health dominated the public debate about the plant between January and May 1974. On 9 May, The Western Mail reported that the British Society for Social Responsibility in Science (BSSRS) had urged local residents '[T]o demand that BP Chemicals at Baglan Bay publish their pollution figures'. BAG's Secretary supported the BSSRS call for more information on pollution to be supplied to residents. Acknowledging the campaign,

BP revealed the extent of its investment in remedial measures to the press. As The Western Mail explained on 16 Feb 1974:

The company is spending about £60,000 a year checking on pollution...£30,000 on cutting out smells...and a further £225,000 on installing silencers to reduce noise.

Following the Flixborough disaster of 1 June 1974, however, the focus of concern of the members of BAG shifted from pollution and VCM to explosive hazard. As The Western Mail put it; 'Until the Flixborough disaster at the weekend, the Baglan Action Group had channelled their protests towards noise and pollution at the plant' (4 June 1974). BAG's Secretary described the mood shift thus:

I think everybody was a little stunned and shocked when the news came out. But what has alarmed us is that the experts have said this sort of thing could happen again (Echo 4 June 1974).

(This comment bears certain similarities to statements (Kennett 1982) made by Flixborough residents on realising that they had been living next to a plant with the capacity to explode with great destructive force).

Interestingly, in a statement to The Western Mail, the group's Secretary hinted that BAG had been conscious of the plant's explosive risks for some time but had chosen to remain silent:

Some of us have had anxieties about this type of incident which we have not pressed publicly to avoid being alarmist (4 June 1974).

In a letter to The Echo, BAG's Chairman made the same assertion:

Wishing to alarm no one the Baglan Action Group played down the all-too-real parallel which exists here. Nobody can accuse us of selfishly exploiting the tragedy for our own ends…(17 August 1974).

It seemed to BAG's Secretary that the situation at Port Talbot was potentially more serious than that at Flixborough:

There were acres of farmland surrounding Flixborough, but at Baglan Bay there is a school on the perimeter of the site…If a similar explosion occurred at Baglan Bay, it would rip the school from its very foundations (Echo 4 June 1974).

BAG's Chairman had no doubt that a catastrophe was inevitable:

Unfortunately…the question is not 'will it'? but 'when will it go up and how many will go with it'? In such an event… both workers and BP's closest neighbours… would stand no chance…Should they survive an explosion the poison gas…would rapidly dispatch them (Echo 17 August 1974).

BAG called for a review of the plant's explosive risks, as did The Port Talbot Environment Society, Port Talbot New Tenants' Association (PTNTA) and the Aberavon North Ward Labour Party. 'Because of the concentration of housing and schools nearby… People have the right to know what the dangers are', said the Chairman of PTNTA (Mail 5 June 1974).

In mid-June, BAG published a report on the risks presented by the petrochemicals complex. It contained the following unequivocal statement of concern:

In the light of the Flixborough disaster the dangers of explosion and fire are obvious (Mail 15 June 1974).

It would appear that Flixborough had 'made obvious' to BAG the 'dangers of explosion'. BAG's report went on:

The two major fires [see above] have caused much concern, but until Flixborough the public did not appreciate the horrifying potential of such a plant… At this time it would be wrong not to press for an inquiry into the general security of the plant (Echo 14 June 1974).

In July 1974 the government's Employment Secretary announced a program of inspections of plants by the Factory Inspectorate. The Employment Secretary communicated this news to BAG in a letter. BAG's Secretary commented:

We will be watching the situation closely. Until some firm recommendations are made we are still going to be very worried (Mail 18 July 1974).

Flixborough 'freed up' the local political impasse that had existed between BAG and BP's management. Although BP had invited BAG to the plant for discussions, BAG had refused to go. After Flixborough, however, BAG met BP's management on 'neutral territory' at a local leisure complex. A two-hour meeting saw 'frank speaking'. A further meeting was arranged. BP also planned to meet the New Tenants' Association and The Port Talbot Environment Society at a later date (Guardian 28 June 1974).

Conclusion

The most puzzling aspect of BAG's campaign was the way the group played down the risk of explosive hazard. BAG's members attenuated the signals that Baglan Bay might present a serious explosive hazard (the two fires), preferring to 'tune in' to pollution and VCM issues instead. This attenuation might be explained by the nature of the emergencies at the BP plant. The two fires were unlike the Flixborough disaster in a number of important respects: The destruction at Flixborough continued for about a week; the fires at BP were quickly brought under control. At Flixborough there was extensive damage beyond the perimeter fence; at Baglan there was no damage beyond the perimeter. Workers were killed at Flixborough; no workers were killed at Baglan. There were off-site injuries at Flixborough; there were none at Baglan. At Flixborough most of the plant was razed; at Baglan only self-contained sections were damaged. There was extensive and prolonged local, national and international reporting of the Flixborough

A storage vessel on the 1,000 acre plant at Baglan Bay

disaster; there was much less reporting of the two fires at Baglan. Following Kasperson's (1992) discourse on the media it may be this differential that explains the group's pre-Flixborough attitude towards explosive hazard.

As Kasperson explains '…Heavy media reporting appears to stimulate social mobilisation'. Could it be that while the group had always been aware of the risk of explosion (see statements by group members, above) it took the world-wide media event that was Flixborough to persuade the group to 'add the risk to its strand of worry beads'? Perhaps the relatively low-key reporting of fires at Baglan had failed to persuade the group to speak out on the issue of explosive hazard. While BAG had identified explosive hazard as worthy of inclusion in its 'agenda of concerns', such risks were well down the list.

Post-Flixborough the group—now fully tuned-in to the risk of catastrophic explosion posed by such plants—moved the risk up its agenda of concerns and launched a sustained campaign. That is, BAG, having 'sought out the hazard event', was sufficiently concerned by the possibility of a similar fate befalling the plant and community at Baglan that it *amplified* the risk. Kasperson also suggests that 'extent of human exposure' affects risk perception. Certainly the 28 deaths and numerous injuries at Flixborough would suggest the sensitisation of other 'at-risk' populations to explosive hazard.

Nuttal's (1959) *Standard Dictionary of the English Language* defines an heuristic as something that 'leads to discovery'. Following this definition the two fires at BP's Baglan Bay plant should have encouraged BAG to air its views on the subject of explosive hazard. However, while BAG placed explosive hazard on its agenda of concerns it remained mostly silent on the matter, preferring to pursue health issues instead.

Then the Nypro plant exploded, killing, maiming and destroying. The disaster was broadcast across the globe. It even led, indirectly, to new safety legislation. Here, then, was an event that was difficult to ignore. Rachlin's analogy of the traffic accident may provide an explanation for the group's behaviour pre- and post-Flixborough. While, as drivers, we are all aware (in varying degrees) of the risks attendant upon road use, it may take some dramatic and horrifying event—like seeing the physical and human costs of a car crash— to first, convince us of the danger and secondly, to persuade us to modify our behaviour. The car crash—the most dramatic manifestation of the failure of the socio-technical system that is car travel—acts as an availability heuristic, revealing the potential horrors that await the careless driver. As Rachlin puts it, 'You see the flashing lights and you drive a little slower'. Having been sensitised you change your risk-taking behaviour (for a time). As with car drivers, so too with the members of BAG. The lessons of Flixborough were so dramatic and obvious that, for a time at least, challenging BP on the issue of explosive hazard became the group's number one priority. The group modified its behaviour.

But this is possibly not the whole story. There may be another dimension to the risk debate at Baglan Bay: qualitative differences between the various risk-related events. The fires were short-term hazards. The second blaze expired in 35 minutes. While there were trans-boundary impacts (the pall of smoke) these soon disappeared.

In contrast, the dust, noise and light pollution and odours from the plant were more persistent. Such hazards had an 'irritant' quality. Unlike the transient hazards of fire and explosion, they were frequently manifest. They also generated much complaint from the community. Given that BAG's primary mission was to 'fight pollution', these hazards were obvious candidates for amplification. After Flixborough, BAG's leaders insisted that they had been aware of the plant's explosive risks all along. They had simply chosen to remain silent to avoid panicking the community.

This might be true. Alternatively, it might be that it took a disaster as dramatic and visceral as Flixborough to make obvious the attendant fire and explosive risks inherent in chemical process industries.

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