

THE ANSEL DUNHAM LECTURE

PLUS CA CHANGE: REFLECTIONS ON 40 YEARS IN THE UK MINERALS INDUSTRY, AND A LOOK TO THE FUTURE

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ABSTRACT

This paper will offer the author's personal perspective of changes in the extractive industries and the wider world over a career spanning 40 years to date. Since the mid 1970s the minerals scene in the United Kingdom (UK) has changed markedly due to internal and external drivers and the profession has changed with it. Some of these changes will be considered in the light of wider societal contexts.

Four decades have seen several economic recessions, each different in characteristics; several periods of boom and bust at home and abroad; the increasing importance of quarry and mine restoration; consolidation of the industry and the disappearance of many company names; the growth of European legislation; a better dialogue between the industry and Government; a linking of our industry with the fortunes of others; and major improvements in safety.

The day to day work of the industrial geologist is significantly different now. It is suggested that earth scientists have a duty to be ambassadors for the industry and to help inform both the public and the legislators, but also that we have a voice on wider matters such as climate change and energy issues in which we are uniquely well qualified to engage in the debate.

Some suggestions will be offered as to what the future may hold. There will be a future, there will be more changes; good and bad, and this profession will rise to the challenges.

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INTRODUCTION

Delivering the Ansel Dunham lecture is both a privilege and a challenge. Ansel Dunham was an inspirational individual, one of a handful who simply walk on a different plane to the rest of us. Having always said 'a handful' the author wrote down a personal list and came up with only eight names. In a busy adult lifetime that is a short list.

In mineralogical extractive industry terms they would be the Olympic Dams, the Argyll diamond pipes, the Bingham Canyons - but where does that leave perfectly good, intelligent, talented people? This question will be considered later.

The author is most closely associated with Redland Aggregates and subsequently Lafarge, having served 34 years in these 2 companies, but leaving in June 2013 as a consequence of the Lafarge - Tarmac merger. Aged 60 in 2013 and after 39 years in industrial geology it was stimulating to leave the big corporate environment and set up a small limited company. The EIG lecture invitation presented a timely opportunity to look both backwards and forwards, leading to a consideration of how the author perceives that the minerals industry has changed over that time in the context of other aspects of life. Change in professional and personal life is driven by

a complex interaction of personal circumstances, external factors such as legislation, company fortunes, global events, and luck.

The paper will broadly characterise the decades from the 1970s to the present day and consider some of the changing influences on mineral companies and the practising geologist. It will suggest where the industry and the profession might be going in future and will touch on the role of extractive industry geologists.

There are messages that the author would like the profession to convey to the wider world and finally a mention of the role of inspirational people.

OVERVIEW OF FOUR DECADES

In January 2014 the UK Minerals Forum published a very timely report entitled 'Trends in UK Production of Minerals' (UK Minerals Forum, 2014). Timely not only because it deals with a variety of minerals in the UK over the author's timeline but also because it makes a link with energy supply which is rarely made.

Before consideration of the detail there are several giant leaps in technology that encapsulate some of the

changes that have affected personal and professional life. Society has moved from: Slide rules to cloud computing; plug-in telephone exchanges to satellite phones; paper libraries to internet resources, and simple survey equipment to LIDAR scanners and Unmanned Aerial Vehicles (UAVs).

There is an important message about the profession's ability to cope with change, about which a lot of rubbish is spouted. It is often implied that people in the workplace have difficulty coping with change without the help of training and counseling – and in the case of traumatic and unpleasant events this is sometimes true. But otherwise change is a constant and is stimulating. Not all change is good of course, and change for change's sake, much loved of 'dynamic managers' is often a waste of time.

Sometimes change takes place slowly and it is only by looking back over a period of years that it becomes clear how substantial is the cumulative effect of gradual changes.

The 1970s

This will sound like the Dark Ages to some younger colleagues but honestly it wasn't that long ago, and the mid 1970s are the start of the author's professional story. But at the very beginning of the decade in 1970 a holiday job took the author into the North Sea on survey boats engaged in positioning oil rigs for one of the early exploration rounds. The offshore oil industry was in its infancy only about 18 months after the first commercial discovery of oil in the North Sea. Britain was not in any real sense an oil producing nation.

In 1974, the year before the author graduated, the UK was in deep recession and had (in the author's opinion) a weak Edward Heath government; a 3 day working week; fuel shortages and rationing; the country was taken into Europe; there was union rule, poor management and demarcation disputes in the workplace; and the British Leyland car company embraced possibly all that could possibly be got wrong in a commercial enterprise.

The UK land based minerals industry was dominated in volume terms by coal; iron ore (worked in Northamptonshire); Fluorspar and tin, and other small volume mineral sites were active (Bloodworth, 2014). The construction materials sector was proud of being nearly as big as coal in total. There were hundreds of companies in the aggregates sector but consolidation was just starting and the family names and family history of some companies began to disappear. The late 1970s saw an early sophistication of restoration and environmental techniques together with the integration of restoration plans into quarry design.

Most aggregate mineral assets were owned freehold - which later became very important in defining the ability of companies to deal with boom and bust. Company car fleets and quarry equipment were usually owned. Personnel could drive cars into the quarries.

Legislative and external factors included the Control Of Pollution Act (1974). This brought a much greater control of landfilling operations and had a beneficial effect on the style and future environmental impact of

restored mineral sites. The regulation of the use of water under the various Water Resources Acts (1963 and 1991) was still in the gift of Regional Water Authorities.

For practising geologists a material change was the founding in 1978 of the Institution of Geologists that provided a professional home for industrial geologists, a route to Chartership in its own right, and created the Extractive Industry Geology (EIG) conference.

The author joined Redland Aggregates in 1979 after 3 years in Nigeria working on water well drilling and water supply engineering followed by 1 year in the North Sea oilfields. Staff levels numbered 7 in the Land and Mineral department. A typical planning application was perhaps 20 or 30 pages long, mostly written in-house and was free to submit.

The Sand And Gravel Association (SAGA) as a Trade Association represented only part of the aggregates industry whilst several other bodies represented different mineral extractors and manufacturers of mineral based products. Representation of the minerals industry to the public and to political decision makers was thus fragmented and inevitably inconsistent.

Figure 1 shows the total Great Britain (GB) land won aggregate sales during the decade and reflects the 3 day week by the decline from a peak in 1974, followed by a small recovery 1978 to 1980. Aggregate sales had for decades closely reflected the Gross Domestic Product (GDP) and this strong link was used to explain variations in sales and also for future forecasting.

The 1980s

Apart from a dip in the early years the decade was characterised by growth; accelerating rapidly and leading to very large forecast future volumes. Professionally and personally it was a very stimulating time.

The early 1980s saw the start of the plan led system in national minerals planning. One of the debates was whether minerals planning should be geology led or policy led, and different County Councils took different approaches. On the professional front many planning applications were decided by Public Inquiries in the adversarial format - an expensive process but extremely valuable and stimulating in terms of professional growth.

A short sharp recession in 1982 was dealt with by the author's employer, by parking equipment and keeping people employed, sometimes doubling up crews on active quarry sites. This was easy for a company to do because of (largely) freehold mineral ownership, and lower structural overheads. There were few leases with continuous working clauses, minimum tonnages and other obligations to landlords. Profitability and returns on capital however remained reasonably healthy.

Figure 2 illustrates the steady and rapid growth of volumes from 1982 onwards. Low growth forecasts of the time anticipated volumes in excess of 300 million Tonnes per year and high growth forecasts predicted volumes above 400 million Tonnes per year by the mid 1990s. The decade and the day to day work of the geologist focused strongly on exploration, mineral acquisition and permitting, and quarry development all to feed the voracious demand.

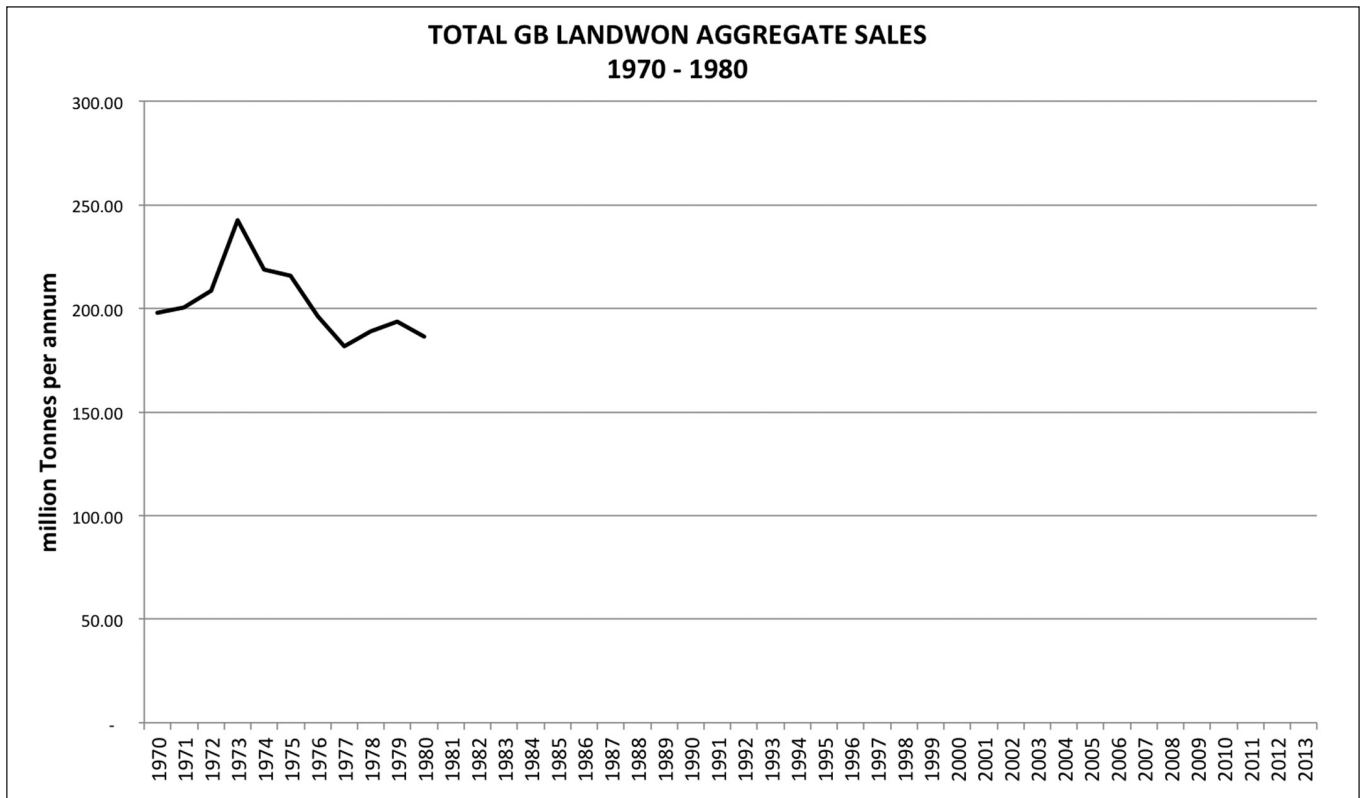


Figure 1. Great Britain land won aggregate sales 1970 to 1980. Source: British Geological Survey (BGS) UK Minerals Yearbook 2013 (BGS, 2014).

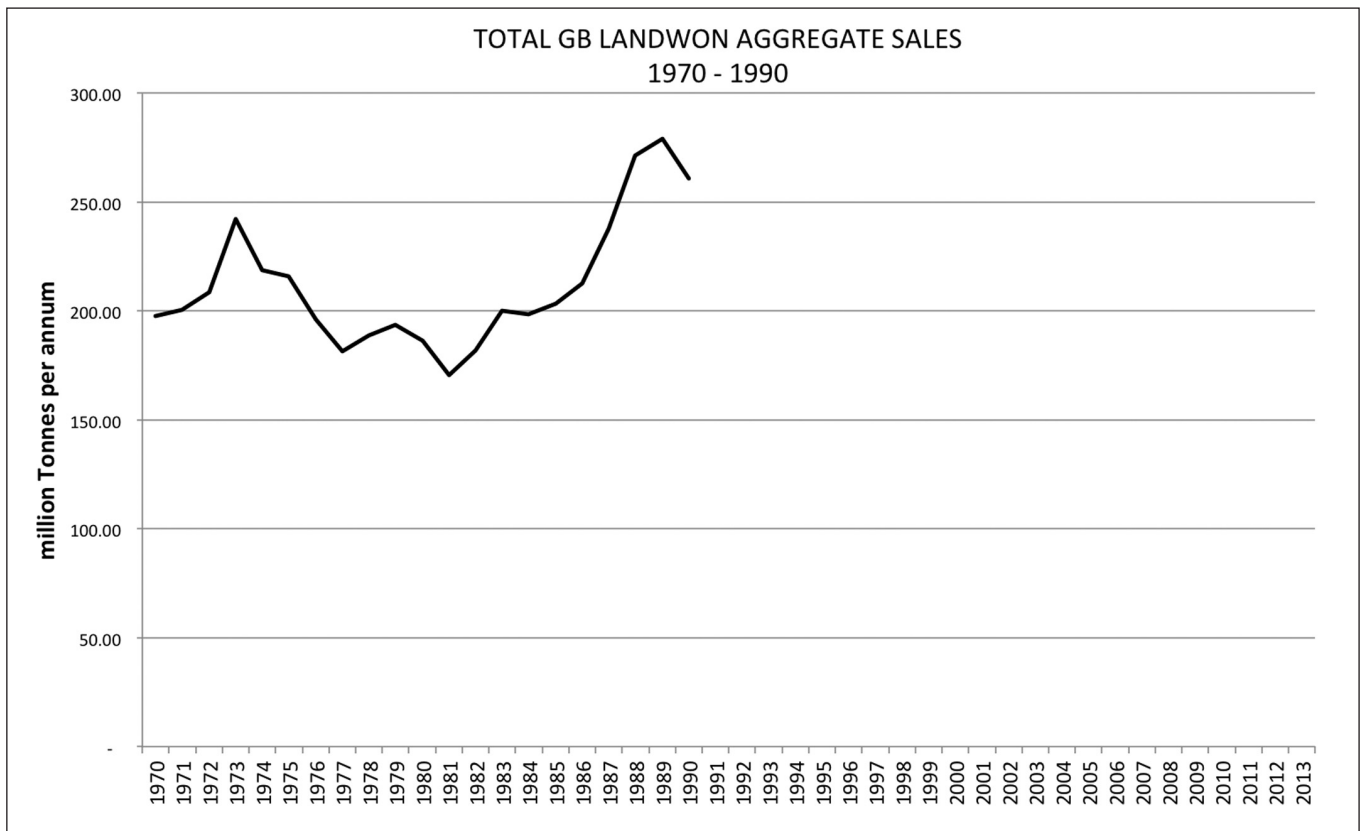


Figure 2. Great Britain land won aggregate sales 1970 to 1990 Source: BGS UK Minerals Yearbook 2013 (BGS, 2014).

Many of the land deals and corporate moves executed in the decade, which still affect company balance sheets today, look extravagant or speculative in hindsight but must be viewed in the context of the times.

Redland Aggregates during this decade moved more into hard rock extraction through acquisitions, and unified the formerly separate gravel and rock operating companies.

Consolidation in the industry was causing the loss of company names that then passed into history. From memory something like 170 UK company names disappeared. Corporate acquisitions by Redland gathered pace in the UK and also in the USA (Texas, Colorado, Maryland, and New Mexico) and France. Other UK construction materials groups were just as acquisitive.

For the geologist in a long hours and high mileage culture the Little Chef diners dominated the roadside and provided valuable sanctuary for early breakfasts, late evening meals, and pre-meeting venues. Fleets of Ford Cortinas and Vauxhall Cavaliers occupied company car parks and many staff aspired to join the 2 litre club.

By 1986/1987 wired in carphones were making an appearance, leading to a significant liberation of communication for those of us who travelled a great deal by car. Analogue signal was available 30 kilometres inland in France which was a major help to the author on regular cross-channel visits to support the growing Redland Granulats company.

Technology drivers, much earlier than memory might indicate, included the Space Shuttle series of launch vehicles. The Shuttle visited the UK via Stansted Airport in June 1983. Much of the technology that underpins modern life, from mapping to communications is dependent on the advances in space engineering and is largely taken for granted now.

Staff levels had risen slightly in Redland as the company grew and we all benefitted from broad and flexible roles within the team. Rapid decisions and flexible thinking were encouraged, and possible, in a relatively small team with national responsibilities and in which each member had a close understanding of the detail of colleagues work.

From 1986/1987 onwards a focus on coastal quarrying took the author and the company from the tip of Cornwall to the northern tip of Scotland and from the Outer Hebrides to Norway. As early as 1976 large coastal quarries had been mooted in 'Aggregates: The Way Ahead' known as the Verney Report (Verney, 1976) and two later Government studies by Dalradian Mineral Services (1980) and Ove-Arup (1990) had identified candidate sites. Many medium size coastal quarries existed already and some of the focus was on whether these could deal with higher outputs needed to meet the projected high national demand. At the same time Norway was actively promoting coastal resources to the European nations and several opportunities were worth a serious look.

On the wider professional front the 1988 Radioactive waste disposal debate involved (in the author's opinion) the public relations disaster of the Nirex search for disposal sites for low and intermediate level nuclear waste. The author became involved in the Geological Society's submissions on the matter and it was an instructive excursion into the professional world outside of one's paid employment.

The fall of the Berlin Wall in 1989 influenced companies with a European presence and particularly the Redland Group with its major roof tile company in Germany.

The 1990s

In retrospect this decade was not as stimulating as the 1980s but in terms of the number of influences it probably constituted the greatest period of change in the 40 years.

In 1991 the First Gulf War brought global events into the office; 12 Redland personnel from the Middle East readymix concrete company (11 of them based at the office in Cambridgeshire) were taken as human shields. Fortunately all returned home intact.

In 1992 Redland acquired the Steetley Group in a hostile bid that had been launched in late 1991. It was one of the biggest corporate evolutions in the history of UK extractive industry. The acquisition increased the size (measured by number of units and geographic footprint) of Redland Aggregates in the UK by 250% overnight and brought entire companies in the United States, Canada, Spain and France into the Redland fold. That was a change.

With unfortunate timing the UK was on the brink of a major recession in the construction industry. In early 1993 sales volumes fell, staged a modest recovery and then plunged to new lows through 1996 and onwards (Figure 3). In volume terms the minerals industry has never emerged from this recession and the trend of companies trying to reduce production capacity in order to follow the market downwards continues to this day. By the end of the decade volumes were flat-lining and amongst other consequences was an end to the 'coastal experiment'.

Corporate responses to this situation brought significant and enduring changes to working life. There were substantial redundancies in the industry and a positive obsession with headcount, partnered by a major growth in outsourcing of professional services that were still needed to support the management and development of operator's mineral estates. The managing of outsourcing is a skill in itself that had to be learned rapidly, some perhaps naively thinking that a phone call would be made and everything would simply be done.

Restricted access to financial capital led to a huge growth in leasing for the acquisition of minerals, rather than purchasing, and over time this extended to car fleets, mobile plant, transport fleets, and other mining facilities. Leasing certainly reduces the capital requirement but it does bring challenges in itself by way of a reduction of control and a suppression of profit growth. Most modern leases will have continuous working obligations; an indexation of royalty payments means that companies share a proportion of any sales price increase with a landlord; leased sites require more estates management than owned sites; the company has less say in afteruse and will often not be able to benefit from land development potential in the years after mineral extraction.

An interesting and welcome consequence of leasing cars, in the author's experience, was an improvement in the style of vehicle available but also a reduction in car park politics as the link between grade of car and seniority became blurred.

In the workplace major changes took place with the advent of Microsoft's Windows 95 software, introducing

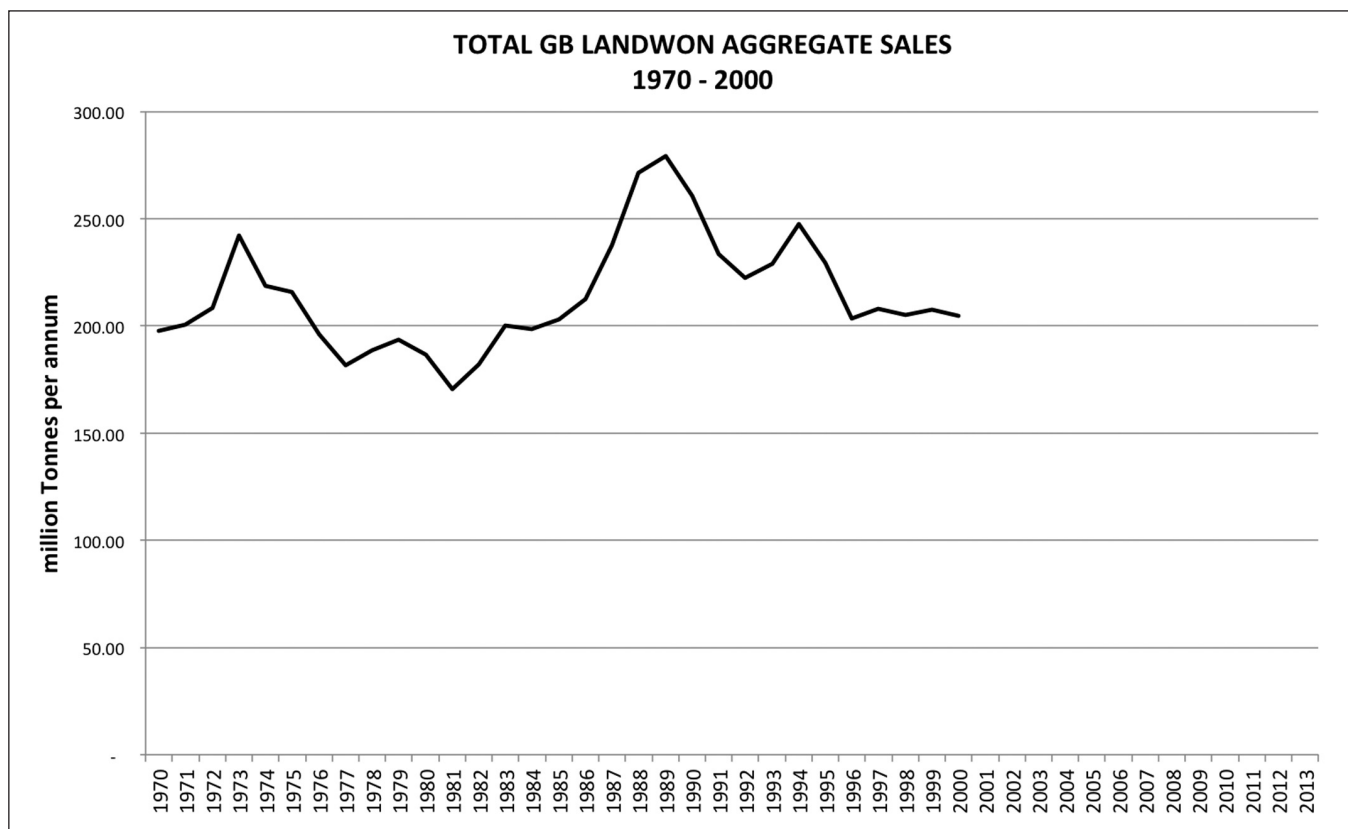


Figure 3. Great Britain land won aggregate sales 1970 to 2000. Source: BGS UK Minerals Yearbook 2013 (BGS, 2014).

the Graphical User Interface and spearheading the American giant’s ambition to put ‘a computer on every desk’.

At a time when the industry was still trying to adjust to the financial consequences of investments made in the buoyant 1980s there was an explosion of environmental legislation. The Environmental Impact Regulations 1988 (Town and Country Planning, England and Wales, 1988) came into effect early in the decade and spawned a subsequent raft of law and regulation including the Environment Act 1995. The author’s paper at EIG 2012 (Wardrop, 2014) listed in several tables much of the legislation touching on water alone. A typical planning application with an Environmental Impact Assessment (EIA) was now up to ten times the number of pages of a 1970s application, took longer to prepare, involved outsourced specialist providers, and cost perhaps £80,000 to £100,000.

The 1992 Earth Summit in Rio de Janeiro brought the concept of sustainability to the fore, a concept that, since the introduction of the National Planning Policy Framework (DCLG, 2012) in the UK, now formally underpins planning policy and decisions. Managing a mineral estate in this context and with growing leasehold properties to manage was instrumental in an increase in staff numbers, time demands, and outsourcing costs.

In 1996 the Environment Agency (EA) was formed giving the minerals industry a powerful national regulator to deal with.

There was (and still is) general concern on the resourcing and training of professional planners and mineral surveyors at national Government level, in County planning authorities, and available for

employment in industry. Local Authority Departments came under increasing budget pressure, and the result was fewer minerals specialists and more generalists. Planning officers with a policy background rather than a technical background seemed to become more prevalent whilst an increasingly wide brief made it difficult for officers to gain prosaic on the ground experience.

Figure 4 illustrates a significant event around 1994, especially in the aggregates world, which had wide repercussions. In the mid 1990s the historic close link of aggregate sales with GDP, which dates back to the 1950s, was broken. The reasons for this disconnection are many and complex, and still under debate, but at the very least include a growth in the recycling of aggregates, the effects of aggregates levy and landfill tax, and changes in construction materials including a greater use of glass, timber and steel. This all made forecasting even more difficult.

In the wider world in 1995, the EasyJet budget airline was born, followed by a rapid growth of airlines on a similar model. The result was a significant change in both personal and professional lives as travel became much cheaper over a wide geography. Meetings could be held cost effectively with colleagues from far afield in companies with a wide national or international footprint.

Ramifications arising from the reunification of Germany and a complex series of other influences caused difficulties for Redland and the share price fell significantly. By the end of 1997 Lafarge successfully acquired the Redland Group through a hostile takeover and thus became the first European cement manufacturer to take a substantial presence in the UK construction materials market.

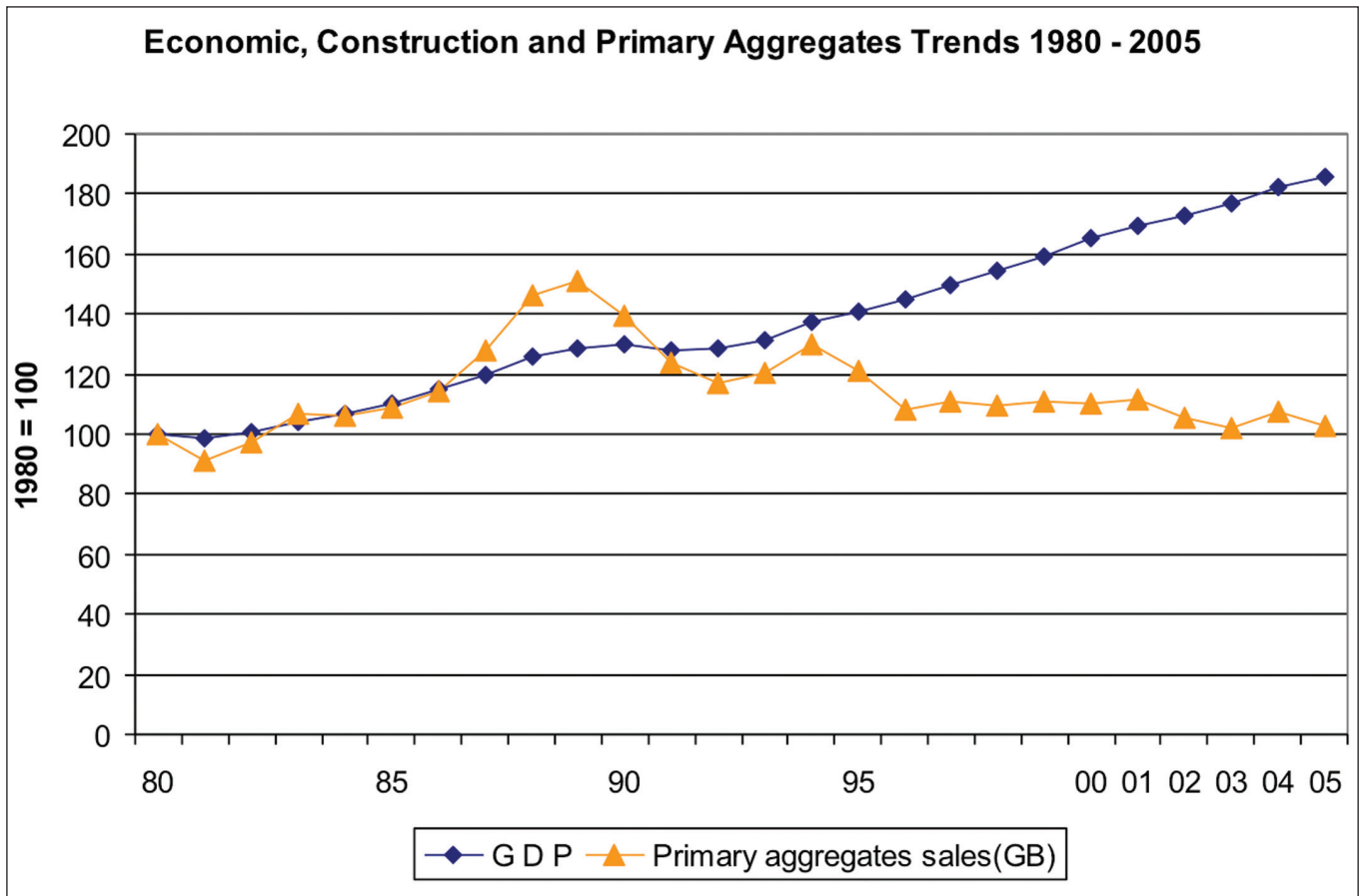


Figure 4. The relationship between primary aggregate sales and Gross Domestic Product (GDP). Source: Based on BGS and Office for National Statistics (ONS) data. Vertical axis shows aggregate sales and Gross Domestic Product (GDP) as indices relative to a datum of 100 in 1980. Horizontal axis show years from 1980 to 2005.

Within the UK there was a complacency in some Government circles about the national ‘landbank’ of construction materials. A figure of over 9 billion Tonnes was widely put about leading some to suggest that overall the UK had around 45 years worth of permitted aggregates and little requirement to issue new planning permissions. Allied to this was an assumption that any shortfall would be made up by imported materials; completely ignoring the costs to the customer, the availability of suitable ports with suitable land infrastructure, and the capacity of transportation links.

Some people felt that the landbank figure was substantially overstated quite apart from the well known inequality in the geographical distribution of reserves. Reasons for an overstatement and also an inevitable lack of precision included the inclusion of Interim Development Order permissions, where many if not most cases were not supported by thorough site investigation work or even conceptual mine design; Northamptonshire Ironstone permissions were included which in practical terms were never going to be worked once that industry had shut down; and there were legitimate doubts about the accuracy of some resource numbers and the degree of site investigation behind them.

By the end of the decade the working life of the extractive industry geologist, broadly speaking, had become more deskbound and computer focused, very cost and safety conscious, less exploration and development driven, operating in an increasingly

outsourced model, and in the bigger companies dealing with more internal bureaucracy.

The 2000s

In many ways quite a dull decade with ‘business as usual’ for the bigger companies whilst some medium size enterprises made useful acquisitions and created some well crafted company footprints at the regional or national scale.

Early in the decade the Quarry Regulations 1999 (HSE, 1999) came into full effect bringing with them a major improvement in quarry safety. In the author’s view this was a very effective piece of legislation not least because of the Health and Safety Executive’s (HSE) initiative in setting up the ‘expert group’ comprising professionals from the quarry inspectorate, industry and consultants.

Meanwhile within Lafarge we were able to watch from the inside as other UK mineral operators became owned by European or transatlantic groups such as Sibelco, Omya, Heibelberg, Holcim, and Cemex. Lafarge formed a region embracing much of northwest Europe and enabled the author to travel to several countries as the sourcing and distribution of mineral became a wider European matter.

Sales volumes in the UK continued to decline slowly and much of the industry continued to try and balance

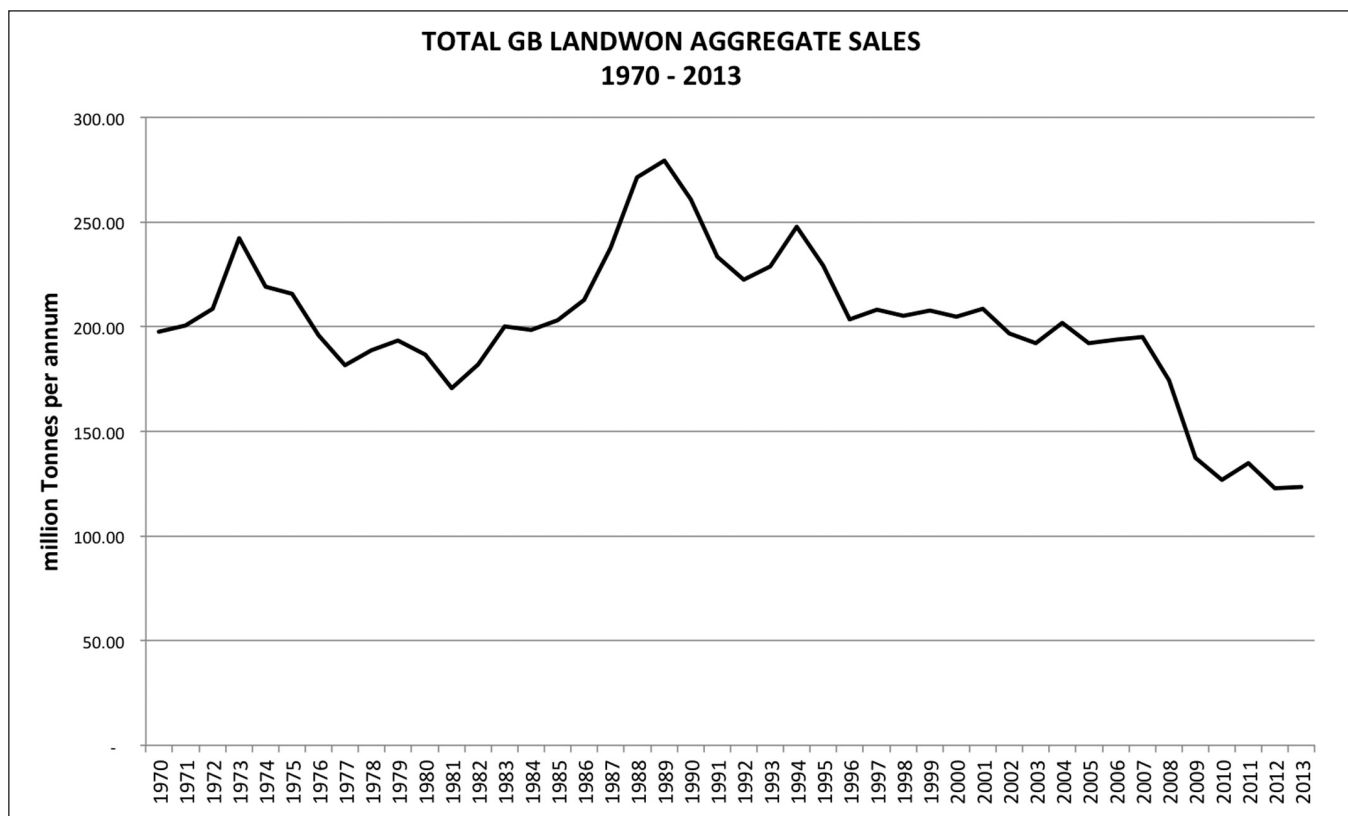


Figure 5. Great Britain land won aggregate sales 1970 to 2013. Source: BGS UK Minerals Yearbook 2013. (BGS, 2014).

the falling market with reduced capacity whilst managing financial pressures including embedded costs of previous asset acquisitions. Continuing low Government investment and a lack of major infrastructure projects suppressed demand. Exploration rates and consequently replenishment of sold mineral reserves remained low throughout the decade. The financial crisis of 2008 precipitated the greatest and most rapid fall in volumes in the 40 year period (Figure 5) and only very recently has there been a modest recovery.

Globally of course the tragedy of 11 September 2001 ‘9/11’ had and continues to have an effect on everybody’s personal and professional life.

On a more positive note the then Quarry Products Association (QPA) in conjunction with industry representatives, early in the decade successfully gained Government acceptance that a much smaller national aggregates land bank was realistic. The groundwork was then established for at least a more realistic assessment of ‘need’ within the planning debate. A very positive development was the award of annual aggregates monitoring contracts to the BGS which is a very appropriate role for a national survey and brought a welcome consistency to the recording of the minerals market numbers.

As the QPA membership developed and the organisation changed into the Mineral Products Association (MPA) (in 2009) the breadth of industry represented by the organisation widened considerably. With this came an increase in political influencing and a sophistication of the message about the role and importance of minerals and mineral products to society. This trend continues and must be maintained into the future.

A LINK WITH THE ENERGY DEBATE

Many of the constraints and public perceptions suffered by the minerals industry are common to other industrial sectors, particularly the energy supply industry, and in the 2000s it became apparent that there could be benefit in sharing experiences or ideas with this sector. The hope is that public education and political influencing would be more effective where there is common ground between sectors that have the potential to reinforce key messages.

The author and a colleague became involved in the early 2000s energy debate through professional bodies such as the Royal Academy of Engineering, The Royal Society, and the Geological Society. The aim was to get nuclear energy included in the future energy mix covered by the 2003 White Paper (DTI, 2003). Efforts were only partially successful to the extent that nuclear was not ruled out but arguably the groundwork was laid for a later Government to positively opt for new nuclear build. The exercise was another example of geologists using their wide environmental knowledge to inform the debate in sectors other than their day to day employment.

The author’s view on energy supply is encapsulated by the phrase ‘optimisation by end use’; a wider principle that the most effective use of resources is achieved when the mix of resources closely matches the end use. Thus a natural sand and gravel deposit that has a grading suitable for use in concrete will require less processing and will generate less waste. By the same principle liquid or compressed gas hydrocarbons are by nature suited to use in mobile transport whereas grid electricity and possibly district heating schemes are best served by fixed generation facilities.

A personal belief is that many in society do not really grasp the importance of electricity. A case can be made that two things separate modern society from a pre-Victorian era namely electricity and modern healthcare. In the event of a major disruption to supply our modern lifestyle ceases almost immediately. Within a few days all the food in a freezer would be useless, communication and computing devices would be run down, most houses would have no water or heating, and cars could not be refuelled. It can be argued that at any one time modern society is only a week away from such a scenario. The risk of baseload supply failure is simply too great to leave to chance or to the pious hopes that 'the market will provide', or that energy efficiency and renewables will make a major, reliable, and sustained difference.

During the energy debate the phrase 'Security of Supply' gained currency and was immediately seen as equally applicable to minerals supply. Indeed a European supply crisis in Rare Earths helped to embed the phrase even in conversations about less exotic materials. Whilst fear is not often a useful motivator in decision making it is necessary to use the phrase because it encapsulates the reality of supply risks when so many factors are beyond our immediate control.

A PERSONAL VIEW OF THE FUTURE

Even if the sold volumes of basic minerals remain low they will nevertheless remain vital to any modern economy and must continue to be available from indigenous sources. Some minerals listed as previously worked in the UK Minerals Forum report (UK Minerals Forum, 2014) are exhausted in Britain and will not be produced again whilst some may enjoy a new lease of life as global prices rise.

In the construction materials world the replenishment of sold minerals by new permissions must improve; operators cannot live on their legacy assets forever. Investment must be made in exploration. Long term monitoring of mineral development throughout the author's career demonstrates that the more you explore the more mineral you find; the more you find the more you can secure; and the more you can secure the more you will get planning permission on. Within the constraints of the market of course.

There are thought to be a small number of locations where the geology is suitable for future underground mining of hard rock aggregates and this may well develop in a limited manner particularly for the more specialised and higher market value materials. It will certainly not, in the author's opinion, be at the often promoted 'Kent deep limestone deposit' in the foreseeable future. Landscape and surface physical constraints, major restrictions on development in National Parks and a growing sentiment against mineral working in or near Areas of Outstanding Natural Beauty (AONB) will all contribute in future years to a genuine shortage of rock resources and strengthen the drivers to go underground. This has already happened in the United States around Chicago with the benefit of very favourable geology. That experience may well be repeated in parts of the UK.

Imports of aggregates to the UK are almost certainly bound to rise in the light of a long term under

replenishment of sand and gravel reserves and a suite of planning constraints that mitigate against the opening of new, high output, long life rock quarries (Jackson, 2010). Ultimately this can be to the detriment of the customer in respect of cost and possibly to the environment in respect of carbon. Accommodating a greater volume of high bulk, low value aggregate imports is not without its challenges since large land areas are needed at suitable ports with a rail connection, rail pathways need to be available on an increasingly congested network, and depots need to be available near the point of end use. Imports are not a panacea.

Much of the UK aggregates industry is already highly consolidated and the potential for major corporate mergers would appear to be fairly low. However, several smaller consolidations and asset swaps have occurred in recent years and some parts of the country still offer potential for minor consolidations subject to the scrutiny of the competition authorities. The planned Lafarge/Holcim global group merger, announced in April 2014 will have major ramifications in the UK and may cause one or more new companies to be created. Indeed, Hope Construction Materials has been created, as decreed by the Competition Commission following the Lafarge Tarmac merger of 2013.

The author poses the question as to whether some of the foreign groups might reverse out of their UK acquisitions.

Companies need to keep check on productivity and internal processes. Many of the larger companies publicly state ambitions to be fleet of foot and entrepreneurial, but then implement managerial processes that do the reverse. The author believes that managers must have the freedom to manage within the proper constraints of budget, objectives, and accountability within those objectives. Electronic procurement systems are a pertinent example where valuable time is taken by multiple people to validate a supplier on a system. Multiple (and often senior) levels of management are required to authorise very modest expenditure, whilst processing invoices takes up senior administrative and management time.

The sophistication and breadth of the minerals industry message to the greater public has improved markedly in recent years but there is much, much more to do. 'The public' in this context can include regulators, planners, and decision makers in a democratic system as well as ordinary members of society with no particular knowledge of mineral matters. Our messages need to cover the spectrum from the personal provision of four basic human needs i.e. food, water, shelter and warmth to the macro-economic role of minerals in a modern industrial economy.

The author believes that the industry would benefit from, and has much more to do, in harnessing the power of television to communicate, educate and influence. Scientific and documentary programmes have considerably raised the profile in recent years but, although it may seem frivolous, a drama series based on the industry could reach many more people. Such programmes as *Ally McBeal* and *Silent Witness* are reported on media websites (BBC, 2015) to have had a positive effect on recruitment to the relevant university courses of law and forensic science respectively.

COMMUNICATING THE VITAL ROLE OF MINERALS TO SOCIETY

Geoscientists, especially in a little understood and not very popular industry have a valuable role to play, and one could suggest a professional duty, to promote the value of minerals at every level from pub conversations to national Government. We have a better knowledge and understanding than many pundits do of a wide range of environmental matters such as climate change, energy supply, radioactive waste disposal, and minerals. We serve society well if we use our voice; individually, through associations, in publications and through conferences.

The author urges all earth science professionals to be ambassadors for the cause. Silence only lets the uninformed voice fill the void. It is suggested that fellow professionals promote the following messages to UK Government - or stimulate informed debate where professionals do not agree:-

- Supply chains message. There is no single, simple industrial supply chain, but many individual supply chains that often link back to feed upon themselves. Minerals, for instance, go into steel, tyres and electronics, and they might be assembled into heavy earth movers that we use to work the minerals. What is certain though is that minerals are so indispensable to humankind that we are right at the top of national supply chains. Politicians and decision makers need to accept this sometimes uncomfortable truth.
- Repatriate and diversify the manufacturing, energy, and mineral supply chains as much as reasonably possible. A 'market will provide' mantra is an abdication of responsibility, is strategically naive, and ignores the basic commercial reality that markets favour those with the greatest financial muscle.
- Security of supply message. Whilst the UK never was and never can be completely self sufficient in minerals (Bloodworth, 2014), it is simple common sense to ensure that as much as possible of our energy and industrial minerals come from domestic or secure resources. It must be strategically sensible to diversify the energy and raw materials supply chain to the UK and to provide resources from domestic sources as much as possible.
- Legislative burden message. The UK minerals industry is highly regulated by multiple regulators, whilst at the same time having no specific Government department responsible for either regulation or promotion of such a vital industry. Much of the regulation is overlapping or duplicated between statutory bodies and the end result is delay and cost; at no benefit to the environment.
- Climate change message. Climate change, with the attendant extremes of weather, is likely to be with us for the foreseeable future and it offers both challenges and opportunities. Government are taking seriously the 'resilience' of UK business to climatic extremes, so the minerals industry is engaging positively in the conversations and could contribute significantly. As major landowners and re-modelers of landscape there is much that the industry can do in a commercially realistic manner to help mitigate the greater frequency of rainfall and drought. Flood protection (hard or soft), flood event mitigation (Clayton et al, 2004), water storage, emergency water supply, catchment runoff control are all areas that the industry can influence. With an open mind some mitigation engineering projects could be permitted or even sponsored whilst generating a mineral yield that would be self financing. The Maidenhead Eton and Windsor Flood Alleviation Scheme (now known as the Jubilee River) certainly benefitted from a healthy net cost reduction due to sales of gravel.
- Resource planning departments at the national and local level. Society and the minerals industry need suitably trained professionals, not a reduced number of policy generalists, in order to grasp and have thorough understanding of the complex issues under debate. Grasping the flood events nettle alone requires an acknowledgement of reality, a conversation about flooding mechanisms, and a prosaic response in terms of planning decisions and building regulations. Whilst we have to build some homes in floodplains much can be done in terms of building style and the mechanics of utility connection right now and at low cost.
- Government should engage continuously with the industrial and the academic earth science community on a wide range of matters, not least energy supply, nuclear energy and waste, minerals supply, and climatic extremes.
- The UK should rapidly and significantly increase a nuclear power station building programme. The author argues that a major proportion of future base load electricity supply should come from nuclear as a low carbon and potentially renewable energy source. Five or six more Hinckley Cs need to be commissioned and built to a common design. Energy efficiency and conservation is vital and must be promoted but the fundamental sources of energy must be secure, reliable, in an effective mix, and as much under national control as possible.
- To regard infrastructure development as a social investment, within reasonable limits. Many roads, railways, bridges or other transportation links are necessary because they fulfill a vital function though they might not be 'cost effective' in conventional terms. Infrastructure in the UK tends to be built too late, too slowly, and under capacity. There is not yet full mobile phone coverage (never mind 3G) throughout our major road and rail corridors and in this alone we lag behind many other countries.
- Support national geological surveys. The BGS and its counterparts in other nations have a complex and multi-faceted role that is not easy to understand and often suffers from political expediency. They undertake fundamental research but are not academic institutions; they have varying degrees of commercial interest but are not commercial organisations; they often underpin mineral exploration but are not dedicated exploration companies; they sometime promote trade in geological resources but are not trading organisations; and so on. However the basic archive of material that they look after - often going back to

the dawn of geology as a science - is beyond price. Fundamental mapping, various specialisms, geochemical sampling, being the national repository of samples and information, seismological and magnetic field monitoring, mapping such a Tellus that companies would not afford, providing open source information, advising Government, are all important tasks that would not sit well in commercial or academic bodies, or in mainstream Government departments.

CONCLUSIONS

In addition to the day to day business of developing aggregate operations in a dozen or so countries the author has participated in 18 Public Inquiries, more than 52 Due Diligences for mergers or acquisitions, 3 High Court cases, and 1 House of Lords Select Committee. Some lessons have been learned along the journey. Powerfully amongst these is that, for all its slowness, frustration, and sometimes perverse outcomes, democracy works and the proponents voices will usually be heard.

This paper has provided a personal perspective on how the construction materials industry and the role of the geologist therein has changed over the last 40 years. It also provides a commentary on the influence geologists can have in this changing world on related subject areas; all of which are highly relevant to the future of the extractive industries and are to the benefit of a general, social development. Geologists can be ambassadors for the cause and the role of extractive industry geologists can be so much more than the day to day function:

- Broad: geoscientists through their technical education understand more about how much of our world works that many other disciplines.
- Professional: well educated and generally vocationally committed, the minerals geology community must continue to behave professionally and with integrity.
- Ambassadorial: the minerals sector is neither high profile nor well understood, a bit of a Cinderella industry, and is generally not well perceived by the public. We have to use our personal contacts to try and reverse this poor perception. Even small facts such as the use of quarried products in toothpaste or the major employment contribution of the industry in National Parks can help to open the public mind.
- Cross sectorial: we have a right, and one could say a duty, to use our experience and understanding to inform people (society at large and Government), on issues much wider than just our particular industry or area of paid work. Climate change, energy supply, global pollution, waste disposal, infrastructure provision, water supply, ecology, environmental health, use of landscape, even some aspects of geopolitics are all areas in which minerals geologists possess considerable knowledge even where they may not take a specific interest in a particular topic.
- Society leadership: because of the importance of mineral products to every human being, but the lack of understanding of that importance, the geoscience community must strive to take a leadership role in

educating and forming opinion in society at large.

Propagandising is wrong and a good way to lose friends, but a legitimate goal in a society is to enable rational and balanced decisions to be made. We should therefore at least try to counter the misconceptions, the simply inaccurate, and sometimes the mischievous mis-information put about by others.

- Government influencing: Government, of whatever political stripe, can only make effective decisions on practical matters when properly informed. Mechanisms do exist and do (sometimes) work to enable professionals to pass good advice into the machinery of Government. There will never be a direct acknowledgement of an input, there will often not be a tangible cause and effect, and the manifestation of any effect will not be swift, but the people whose actual job it is to inform the Government of the day will often recognise good advice.

Mechanisms for all of these actions exist and just need to be used. From talking to people in the pub, through communicating with an MP, helping teachers, writing articles, publishing papers, attending meetings and conferences, asking questions, attending industry groups, supporting trade association, addressing specific individuals, all of these activities can have a beneficial cumulative effect.

POSTSCRIPTS

On leaving a large company after being in continuous employment since graduation the author had some simple decisions to make - retire fully, maintain involvement in the minerals industry, or do something entirely different. It was in fact a very easy and largely intuitive decision to carry on being active in the industry primarily because of the nature of the industry and the people in it. Ansel Dunham was an inspirational individual, and the question posed in the Introduction was 'where does that leave perfectly good, intelligent, talented people?' The unique nature of EIG concentrates the talents and characteristics of the professionals disseminated throughout the minerals world and thus becomes an equally potent source of inspiration.

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