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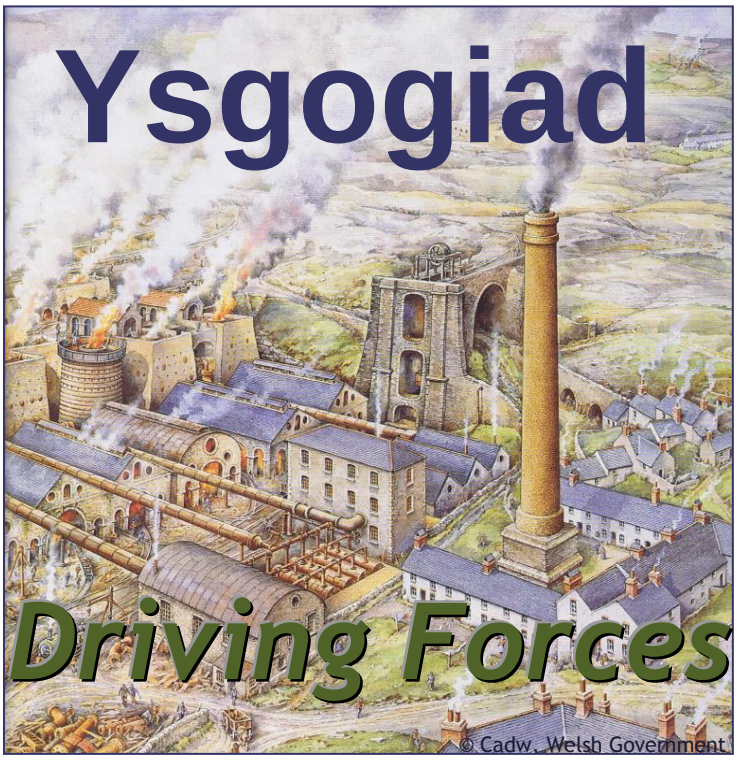
Pan-Wales heritage interpretation plan

Wales - the first industrial nation



Interpretation plan

October 2011

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Llywodraeth Cymru
Welsh Government

ERDF
Llywodraeth Cynulliad Cymru
Welsh Assembly Government
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Pan-Wales heritage interpretation plan

Wales – the first industrial nation

Ysgogiad
Driving Forces

Interpretation plan

Prepared by
Touchstone Heritage Management Consultants,
Red Kite Environment and Letha Consultancy

October 2011

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The illustration on the cover is part of a reconstruction drawing of Blaenavon Ironworks by Michael Blackmore and taken from *Blaenavon Ironworks and World Heritage Landscape*, published by Cadw.

1 Foreword

Why and how?

By the mid-nineteenth century, the people of Wales were beginning to understand the effects of industrialisation. The 1851 Census returns for Wales show that, for the first time in any country, more people were working in industry than in agriculture - in a land where the many found employment in industries that were owned by the few. Wales can therefore claim to be the world's first industrial nation, an assertion supported by the numerous other world-firsts in technology and engineering.1

What were the reasons and the motivations – the driving forces - for Wales' unique position as the world's first industrial nation? And how did it happen? It is the job of this interpretation plan to answer these two questions, along with who was involved, with what, where and when. It is a fascinating, and very complicated, story of inter-related causes and effects that has left a permanent mark on the landscape and people of Wales.

People are industrious

The Industrial Revolution was a process not a single event. Its starting point lay in the origins of human civilisation and, in a sense, it remains uninterrupted today as the technological revolution constantly impacts everyone's lives in a continuous, and exponential, manner. The impact of this process in Wales was so significant in the eighteenth and nineteenth centuries that Wales became a global leader of industry, at the forefront of many new technologies. But to describe this process in Wales as a single 'revolution' is not entirely helpful; its attenuated timescale and the different contributions of different industries made it a series of revolutions as Dr Huw Bowen[2] would describe it. In effect it was (and is) an evolutionary process.

Whether it is a continuing evolution or a succession of revolutions, the changes that took place were dramatic and profound and their ramifications should not be underestimated. Richard Keen[3] suggests it was the most potent change the world has ever seen, affecting forever how people perceive life and landscape worldwide.

Humankind is, by nature, industrious, if only in order to survive. From the beginning, human beings have demonstrated an innate resourcefulness in providing for their lives. Different civilisations have taken this forward at different paces, according to a range of environmental and other needs and circumstances.

Over the millennia, in the so-called 'developed world', that quality has driven people to seek and achieve all manner of invention, innovation and industry, in both senses of the word. The pace of 'development' has varied but it has been most clearly articulated within Great Britain.

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[1] From *The Story of Wales's industry and innovation* by Richard Keen

[2] Dr Huw Bowen, interview, May 2011

[3] Richard Keen ,interview, May 2011

In prehistoric times, manufacturing – literally, making by hand – began with the making of axes and other simple tools. Commerce started when tribes, often many miles away from the manufacturers, sought their products and so trading in goods began with stone axes and moved to hand-made goods and even foodstuffs. What we see today is a technologically and socially sophisticated version of what has always been – the making and selling of goods.

Alongside resourcefulness, among human qualities (well-expressed during the Industrial Revolution here in Wales), is an enthusiasm to experiment on the one hand and a willingness to accept the help of serendipity on the other. Not all innovations have stemmed from invention; many are attributed to good fortune allied to observation. While resistance to change may often be cited as a characteristic of folk in general, history demonstrates the opposite – there has always been a considerable propensity among people to adopt new things and new ways. It may be as a result of encouragement or example, but it continues to happen with increasing rapidity.

Many people were aware, too, that if they (or others) could produce goods (or services) that were demonstrably better than those already in use, they could gain advantage in some way, militarily, economically or culturally. Alongside the spirit of innovation sits that of enterprise although not all inventors are entrepreneurs and vice versa.

The complex story of Wales as the 'First Industrial Nation' involves a co-incidence of critical elements, all working together at a time when society was changing out of all recognition. These elements were its **natural resources** – slate, iron and copper ores, timber and coal, with water for power and transport – a host of **innovations** – often from elsewhere but brought to Wales to exploit the resources – its **people** – with skills, motivation, an inherent resourcefulness and a desire to work and – crucially – a unique range of natural, cultural and economic **reasons** why it should have happened when it did and where it did.

2 Introduction

Touchstone Heritage Management Consultants, Red Kite and Letha Consultancy wish to thank Cadw for inviting us to prepare an interpretation plan to explain and promote Wales as the first industrial nation. We are grateful to the many people we have written and spoken to, formally and informally, during the preparation of this plan. Many have provided very considerable advice and valuable opinion which we have used in preparing this document and, where possible, we have reflected all the guidance we have received. We have appended a list of those who have been consulted in Appendix A.

This plan sets out our approach to the topic and our proposals for interpreting the complex series of inter-related factors which created and propelled the Industrial Revolution in Wales. The background chapters are not intended to provide other than a series of related snapshots to illustrate the why and how, the when, where, who and what of that series of evolutionary events and processes that made up Wales' Industrial Revolution.

For those who wish a more comprehensive history of that revolution, or evolutions, there are many excellent publications and websites to consult. Our role has been to try and identify key elements in the story in order to suggest how that story might be interpreted throughout Wales by those with a variety of responsibilities related to the industrial history – and related social history – of Wales.

The brief

The brief, attached as Appendix C, sets out the objectives for the plan and places it in the context both of the Pan-Wales heritage interpretation plan and of the overarching interpretive strategy for all of Cadw's properties. It was confirmed in initial discussions that Wales – the first industrial nation should concentrate on the story of motivation, innovation, entrepreneurial spirit and commercial success against the wider geographical, historical, industrial and social context.

3 The story of industry in Wales

The origins of industry

Examples of the motivations to move into industry include innovation and experimentation, exploitation of resources (and people), risk and entrepreneurship, investment and economics. The consequences were apparent in the transformation of much of Welsh society (often through workers and their families having to cope with hardship and suffering, but it is also important to understand what drove them to seek employment in industry). The consequences can also be seen in the often dramatic impact on the Welsh landscape, including the rise of industrial towns and ports.[4]

Industry, in its sense as manufacturing, began with making of goods by hand with the use of the humblest of tools and equipment. The ages of human development – Stone, Bronze, Iron – indicate the use of tools and heat to make things from found or won materials that included gold and silver as well as the base metals. The early sites are, in some cases, still in use. Evidence of these primitive developments can be found in Wales where the harnessing of water, wind, animal and human energy were the first power sources.

Industry needs resources and a means to transport both materials and products. Wales has an equable climate and although its topography presents challenges for travel across the heart of the country, there were good communications along the north and south coasts for hundreds of years. The indented coastline allowed for the development of harbours at an early stage and, in South Wales, the valleys later provided opportunities for access to ports by canal and rail. Some of the earliest places to industrialise in Wales took advantage of tidal rivers and coastal ports at a time when roads were non-existent or merely tracks which took days to negotiate.

Wales is also fortunate in the range and quantity of its natural resources as a result of its complex geological structure and variety of rock types. Malleable metals such as copper, iron, lead and zinc are present as well as smaller quantities of noble metals including gold and silver. There are vast deposits of coal and limestone, many of them close to extensive seams of iron ore and even clay as at Blaenavon, although iron ore was often difficult to extract. Coal, though, was the crucial factor in providing carbon for energy and for adding to iron to make steel. It allowed foundries to shift from dwindling supplies of timber to an abundant energy source that was close at hand. The easily-won supplies of raw materials contributed to the rapid development of the Industrial Revolution in Wales, which – as cannot be said too often, led to its becoming the first 'industrialised' nation.

Wales also had water, in abundance in places, fed by its climate and channelled by its rivers into channels sufficient to drive water wheels and turbines. It is important to remember that Wales was industrialised long before steam was used to drive engines, with water used to power the early ironworks and copperworks. It was also vital for transportation in many places.

[4] From Cadw's brief for this project, see Appendix C

Allying the invention of the wheel, in all its forms, to these natural energy sources provided for many existing needs and over time allowed the introduction of new or improved products that benefitted from the extra power that wheels could deliver. However, water was the crucial element in Wales' industrialisation as we know it, literally. It was used extensively for transportation, to drive mills and machinery, to pump air into the furnaces and to pump water out of mines. It enabled early industries to thrive, and helped to create wealth for further investments. Its terrain and high levels of rainfall gave Wales an advantage it this respect.

This was especially important in several parts of Wales, some of which are not now associated with industry. For example, along the River Wye, water was harnessed very early on in the industrialisation process. The power of the tide along the lower reaches of the Wye was also important in assisting the inward transport of raw materials and the outward movement of industrial products, from very early times. Water, as a means of transportation, was a key factor in industrialisation. For example, Swansea's copper industry was wholly reliant upon the sea for importing copper ore and for exporting the ingots that its smelters processed. The Pembrokeshire coalfield, which operated for about 700 years, also relied on the trading opportunities provided by its tidal rivers and coastal ports. In Flintshire, the concentration of ironworks along the Greenfield Valley took advantage of a steady water supply along the river.

Early evolution of industry

What would be regarded as modern industries began in different parts of South Wales. There were a number of centres of early innovative metal making, such as the Wye Valley, Pontypool (where iron master John Hanbury was the first in Britain to develop a rolling mill to make tinplate), around Neath (particularly Aberdulais) and Swansea.

The Wye Valley was one of the earliest places in Wales to industrialise. Activity along the Angidy Valley, which feeds into the Wye at Tintern, was more significant and earlier than activity happening even at Ironbridge. It was the heart of one of Britain's earliest hubs of industry, which saw Tintern develop as a centre for wire working from the mid 1560s, with iron and brass making also becoming important. By 1603 the Tintern works, with a labour force of six hundred, was by far the largest industrial enterprise in Wales; it was also to be the longest-lived, for a version of it survived until 1900[5].

*Copperopolis (*Swansea) can lay claim to being home to the world's first globally integrated heavy industry[6]. It certainly became the centre of world copper production by 1790 and the Hafod Copper Works was one of largest industrial enterprises in Europe by 1840s.

The tinplate industry expanded from its origins in Pontypool, with many tinplate works opening further west using tin principally from Cornwall. Up to the 1880s, Wales produced 90% of world's tinplate, mostly along the Llanelli coast, including

[5] From *A History of Wales* by John Davies

[6] Dr Huw Bowen, interview, May 2011

Europe's first beer can. Tinplate is still manufactured in Llanelli and the only in-situ tinplate museum in the UK is further along the coast at Kidwelly.

The coal industry had early origins too - the Pembrokeshire coalfield, for example, was actively exploited for commercial purposes from the 13th century[7]. Despite its longevity, however, the coalfield failed to embrace changes in mining technology because of the nature of anthracite coal and feudalistic management structures[8].

Power – the key to the story

The key to the evolution of industry was power. Water power continued to be used right through the nineteenth and early twentieth centuries, particularly in rural areas. As industry continued to expand, it employed more and more elegant solutions to driving increasingly productive machinery. But a new source of power was needed that would fulfil increasing demands and take industry to new levels of efficiency.

The power of steam must have been known from early times when water was boiled in stone, pottery or metal vessels. Travellers and traders would have passed on tales of thermal springs in places like Iceland. But steam was elusive – it couldn't be captured in any way that would allow its power to be utilised to the full. However, Wales was soon to benefit from inventions beyond its boundaries.

Iron founding, using blast furnaces that were developed in Europe in the sixteenth century, began on a small scale and depended upon charcoal for heat, but with the introduction in 1709 of the coke-fuelled furnace by Abraham Darby at Coalbrookdale, the manufacture of iron in Wales increased dramatically, helped by the proximity of iron ore, coal and limestone. The skill of the iron founders is as important in the story of Wales's Industrial Revolution as the harnessing of steam - and this is an area where Wales excelled for most of the late eighteenth and nineteenth centuries. Increasingly large products could be made and this allowed the introduction of the steam engine which depended upon cast iron for its boilers, cylinders, wheels and other parts. There is evidence to suggest that Angidy Furnace at Tintern was the first in the country to convert to cylinder blowing.

Thomas Newcomen, an ironmonger and lay preacher from Devon, invented his atmospheric or steam engine in 1712. It was the first practical device to harness the power of steam to produce mechanical work and soon Newcomen engines were used across Britain and Europe, principally to pump water out of mines. Mining expertise came from a number of sources with Cornish tin mining engineers being to the fore in mid Wales.

However, it was not until 1776 that James Watt built the first effective steam engine capable of driving machinery. It was first used in mining operations but with the help of his long-time business partner, Matthew Boulton, Watt devised systems of pistons to create rotational movement and, from then on, the Industrial

[7]From *Pembrokeshire the forgotten coalfield by* M R Connor Price which refers to records relating to coal bought from a coal dealer in Tenby during the construction of Aberystwyth castle in 1282.

[8]Richard Keen, interview, May 2011

Revolution as it is generally regarded was on its way. Their steam engines changed the world.

Nevertheless, despite the importance of Newcomen, and of Watt's, steam engines, these machines could not be built, let alone developed, without the iron vessels to collect, retain and deliver steam, under great pressure, to machinery of any kind.

One of the main driving forces for this early development of industry was the high demand for weapons of war in the late 1700s. The wars in Europe during the latter half of the 18th century and early 19th century required effective and reliable canons and the quest for better weaponry drove the development of better industrial processes. In 1774 John Wilkinson refined a method to bore cannons out of solid blocks of cast iron. These smooth bore cylinders made excellent cannons, and the technology was then used by Watt to produce smooth cylinders and pistons for steam engines. The steam-powered blowing engine, also from 1776, provided a more consistent source of air for blast furnaces than water-wheel powered bellows, and this made iron-making, and later steel-making, more efficient.

The evolution moves up a gear

Industry in Wales had both to respond to the opportunities provided by the topography for extracting and transporting raw materials and goods, and to the challenges which the topography presented by mountainous and hilly countryside with few major rivers and few good roads. This led to innovation and many ingenious solutions for making nature work for industry whether in the supply of water or in the delivery of processed materials.

The readily-available resource of people resulted from the increasing efficiency and mechanisation in farming which led to fewer workers being employed on the land. They began to flock to the towns throughout Wales, attracted by availability of work and better wages, to work first in the iron mines and iron works in the Heads of the Valley and then in the nineteenth century in the coal mines. More productive agriculture produced surpluses which could feed the rapidly growing industrial workforce. There are documented accounts of whole villages in Carmarthenshire being abandoned as the inhabitants moved lock, stock and barrel to industrial hubs such as Cyfarthfa[9].

However, Wales's topography affected settlement patterns. Many small industrial concerns were based in villages where people worked part-time or seasonally while also looking after their small holdings or holding down other jobs. Although the great cities grew up in later years, even the apparently urban straggles in the south Wales valleys were in reality a series of small communities which latterly ran into each other; industry was not clustered, it was very much spread out. Paths which developed under the feet of people going to and from work are now part of the public footpath network.

Adding to the industrial communities were people from further afield. By the mid nineteenth century people were migrating to Wales from many other countries as well as other parts of Britain – Wales by then had the second highest level of immigration after the USA. Between 1904 and 1914, 130,000 people moved into the

[9]Richard Keen, interview, May 2011

South Wales valleys. Communities slowly developed their own dynamics which led to self-betterment and, of course, demands for better working and living conditions.

By the late 18th century and into the 19th, Britain was becoming a global power. Its increasing wealth from colonisation provided yet more resources and more markets in which to sell products. The strength of Britain's merchant fleet provided an ideal means of extending markets into countries within and outside the Empire as well as providing the means for importing raw materials and other resources from around the world. During the later part of the 19th century, ports like Barry, Newport and Cardiff grew large and prosperous exporting coal and iron. One element in the expansion of international trade and the consequent wealth that was generated was the growth, until the early 19th century, of the slave trade. Its precise relationship to industrial capitalism is debated,[10] but it was certainly a contributory factor to the availability of investment capital in Britain.

A new breed of entrepreneurs was keen – and had the resources - to take advantage of the assets and opportunities which presented themselves. As we noted above, trade created enormous wealth and it was this money that was used to invest in new industrial expansion. Much of the initial money invested in South Wales industries came from Bristol merchants keen to invest their new-found wealth (some from slave trading) in other ventures. Like all entrepreneurs, those at the heart of the Industrial Revolution were prepared to take risks – they were entering unknown, if exciting, territory.

Not all the entrepreneurs became well known leaders of industry. Many were 'local heroes' who established their own enterprises on their own land or in small communities, contributing to the overall Industrial Revolution. Some names may be remembered locally, others will have been forgotten, or lost when bigger concerns took over their interests.

The domestic market was also increasing, with a changing social order leading to a rising middle class and increasing levels of affluence. There was relative political stability within Britain from 1688 onwards, save for the two Jacobite Risings which barely involved Wales. In addition, a strong 'Protestant' work ethic was embraced by much of the population and later manifested itself in Wales through non-conformity. Britain had also emerged from the Napoleonic wars as the only nation not severely affected by economic collapse and territorial conquest.

This was the *Age of Enlightenment*, with the development of reason-based philosophy that influenced intellectual, social and cultural life. This gave Britain' an advantage over many other countries at the time in having a society with a high level of 'freedom of thought'. It allowed for innovations in both technologies and administration, and new legislations that 'oiled the wheels' of invention and investment. The patent laws provided rights for inventors of new technologies, freeing them to invest further in their intellectual 'property'. The 'limited company' then provided investors greater security to support emerging industries with their money. This was a crucial 'new invention' enabling the newly affluent to buy and trade shares in companies without risking all their personal wealth.

[10] Matthew Griffiths, comments on a draft of this report, June 2011

A final, more abstract, contributory factor to add impetus to the Industrial Revolution as a whole is that part of the human condition which constantly seeks more – more comfort, more material goods, more wealth. It can be characterised as greed but it is not as venal as that; it is closer to the overall desire for betterment, for social and cultural progress, for what might be summarised as 'self-improvement' and social improvement.

Expansion, diversification and impacts on society

The expansion of industry in Wales made it a global leader. At different points in its industrial timeline, Wales led the world in its production of, for example, everything from copper to coal. By 1914, a third of the world's supply of coal came from Wales. The coal industry employed a quarter of a million people – one in four of adult males. There was not only the export of materials to other countries, but also of skills and labour, with enterprising Welsh industrialists, establishing, for example, iron foundries and new communities in Philadelphia and in the Ukraine.

The expansion of industry also brought new businesses that were essential to the industrial process. Banking and legal services were critical and Cardiff became a major commercial centre providing these 'white collar' services. Some experts feel that this 'middle class' was less significant in terms of numbers employed, others argue that it was important in driving social and political reform. Administration in all its manifestations was a major 'industry' in itself and needed, for example, a constantly growing paper industry to feed it. The markets for goods such as flannel vests for workers and blankets for households kept the woollen industry and related traders buoyant. Many other supply industries flourished from potteries to furniture manufacturers. The Industrial Revolution was a spider's web of inter-relationships and interdependencies. It was not a simple, single strand; it was complex in many ways, technologically and socially.

The Industrial Revolution in Wales brought new raw materials, new means of transport, new communities and international supremacy. It also brought work and increased affluence to very many people who were at the time being squeezed out of an impoverished agricultural economy or who, later, migrated from elsewhere in the UK and from other countries. Wages in the new industries were relatively good, there was more opportunity for the whole family to work – including women (who accounted, for example, for 15% of the tinplate industry's labour force) and children – and, in later years, houses were often provided with a job – in the early period there was an acute housing shortage.

People could also learn new skills and increase their prospects for promotion and higher wages. With greater relative affluence came a developing 'consumer society' and a dynamic economy that created markets for a wide range of goods. Most of the materials processed in Wales, such as copper, iron, steel, slate, coal and tinplate, were not for local consumption but supplied a burgeoning export market. Rural areas benefitted as much as the towns, with increased markets for food and other agricultural products which were produced in greater quantity through agricultural improvements which provided good surpluses from the land.

This new work changed people's lives, not just in providing better pay, but in changing the way they lived and worked. Life was no longer governed by the seasons and daylight, but by shift work at industries that operated day and night.

These benefits, though, were won at a great price – to the natural environment and, of course, to the lives of many people. Today, the areas of 'blight' – which may have their own majesty in some ways – such as Parys Mountain, parts of Snowdonia and the Blaenavon area – continue to bear witness to the demands of a society voracious for better things. Not even the accolade of World Heritage Site can mask the remodelling of nature that changed one part of south Wales.

People moved from so-called self-sufficiency (which for many was near-starvation) to a dependency culture, from the country to the town, from conditions of relative poverty but often to more appalling working and living conditions. The congested industrial communities led to a strengthening labour movement, disharmony and strife that continued through to the current, so-called, post-industrial era.

But the Industrial Revolution in Wales also spawned philanthropy, workers' education, community spirit and positive opportunities for emigration as part of the export of skills, and also a more egalitarian society and a proud record of social welfare provision. And as part of this improvement in welfare there was an enhanced intellectual curiosity, a revival of music and literature traditions and a consolidation of the Welsh language in working communities.

More recently these communities have experienced a spirit of reclamation and regeneration and have continued to sustain and celebrate the distinctive language and culture of Wales. While the level of chapel-(and church-) going may have decreased, the underlying ethos that made non-conformism such a key element of community life remains in many ways and is evidenced through, for example, the tradition of music and the arts in general. The identity of, particularly, the south Wales valleys continues to be celebrated in many ways.

The process continues

The Industrial Revolution is over, by most accounts, in Wales. But innovation and entrepreneurship, hard work and success remain in what is post-industrial Wales where the *Technological Revolution* is creating more opportunities, more openings and more prosperity. Regeneration, including natural regeneration, is also healing many of the physical scars and providing new landscapes, and new uses, that benefit both communities and the environment. The great differences between the Industrial and the Technological Revolutions are seen in the relative lack of pollution and noise, the ubiquitous role of electronic machines and equipment, the hugely different methods of communication, the substantially improved working and living conditions and, in places, a landscape where nature and people are undoing much of the damage of the industrial past through major and local reclamation schemes.

It is ingenuous to suggest that everyone shares the same level of success and prosperity, of excellent conditions in which to live and work. But instead of the majority of the population working and living in squalor, penury and fear, the great majority now live and work in relative comfort and security.

Another dimension to the continuing process of industry and the impact on lives today, and on future generations, is the effect that the Industrial Revolution spawned – the impact on climate through burning carbon. The steady increase in the amount of carbon dioxide in the Earth's atmosphere is attributed (though not

by everyone) to the massively increased use of fossil fuels to feed industrial expansion and also to feed our increasing dependency on power for our lifestyles.

As with all good stories, the real 'meat' of the Industrial Revolution lies in the part played by people from all walks of life shaping Wales as the first industrial nation, and this is at the heart of our interpretative approach.

The sum of the parts – why Wales?

What really made the difference for Wales to have contributed so much to, and benefitted so well from, the evolution of industry? The combination of available raw materials, new sources of power, new machinery, new wealth and thinking, and a long tradition of enterprise all came together at a time of innovation and freedom of thought. Although many of the technologies and innovations came from elsewhere, such as Shropshire in England, it was here in Wales that the fortunate combination of circumstances allowed them to flourish. The census of Wales in 1851 showed that by then there were more people employed in industry than in agriculture, the first country in the world to display this phenomenon.

Why did Wales, therefore, host, embrace and exploit the Industrial Revolution? It was due to a litany of related factors which have been set out earlier in this chapter:

- Close proximity of varied natural resources
- Existing knowledge of basic technologies
- Wide rural dispersal of small enterprises ready to develop
- Availability of human resources
- Driving force for innovation and improvement
- Innate inventiveness
- Exchange of knowledge, skills and labour between Wales and the wider world
- The growth of external markets and a consumer society with increasing wealth
- Re-use of sites for different industrial purposes, adaptation and experimentation
- Desire for better conditions
- Wide ambition
- Entrepreneurial flair
- Availability of large capital resources for investment
- Relative political stability
- Economic stability
- Ease of transport by sea and tidal rivers
- Colonial domination
- Trading opportunity and success

Huw Bowen[11] argues that the fundamental contributors to Wales' industrial success were location, transport, knowledge and skill.

Once it had begun, the great expansion of industry in Wales, and in England too, then experienced increasing efficiency and the development of new technologies and administrations. There was an extraordinary 'lift-off' of industrial output

[11] Dr Huw Bowen, interview, May 2011

during the latter quarter of the eighteenth century and early nineteenth century. The key characteristics of this expansion were:

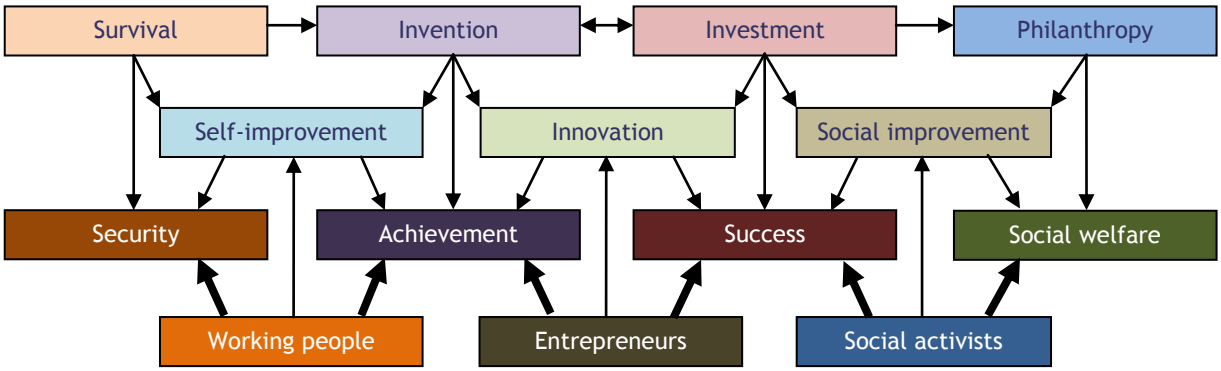
- Refinement of power – through water, coal, steam
- Regional specialisation – South Wales specialised in copper, iron and steel, North Wales in slate
- Economies of scale – furnaces and coal mines increased in size and became more cost effective
- A shift from vegetable to mineral resources – from the use of wood and charcoal to coal and iron
- Mechanisation – reducing the number of hands needed in all processes, and increasing speed
- Transportation – the exponential development of canals, railways, roads and ports
- A shift from a subsistence to a wage economy, where people were employed, had steady pay, and money to spend and feed back into the economy[12]
  A shift from work patterns governed by season and weather to processes that took place continuously

[12] Peter Wakelin, RCAHMW, interview, 2011

4 Our approach – a summary

In seeking to answer the brief, we have developed the approach that formed our foreword and provides the basis for the thematic approach.

We have used the phrase *Ysgogiad / Driving Forces* to summarise the key elements that created and drove the Industrial Revolution and the resultant economic, social and cultural changes. These forces can be encapsulated in diagrammatic form:



Thematic base

We have concentrated on four themes, all of which embody the driving forces:

- *Innovation and exploitation* – motivated by the need to improve and achieve
- *Ambition and success* – motivated by the desire to consolidate achievement
- *Landscape change* – motivated by the need for industrial and residential sites
- *Social reform* – motivated by the need to improve working and living conditions

The themes are set out in detail in Chapter 7.

In providing a means for telling the story of the Industrial Revolution in Wales, or any part of it, we have again used a tripartite basis, one for the innovators and entrepreneurs and one for the social reformers. The first uses three entry points:

- People
- Process and product
- Place

Similarly, the second uses three entry points:

- People
- Activity
- Place

We explain the rationale behind this in Chapter 10.

The brief makes it very clear that the interpretation plan for Wales: the First Industrial Nation should be predicated on the role of people and their motivations, the context in which the Industrial Revolution took place in Wales and its impact.

5 Stakeholders and initiatives

Among the many organisations that have a stake in telling and illustrating the story of Wales as the First Industrial Nation are:

National museums and libraries

- National Coal Museum, Big Pit
- National History Museum, St Fagans
- National Library of Wales
- National Museum Cardiff
- National Slate Museum, Llanberis
- National Wool Museum, Drefach Felindre
- National Waterfront Museum, Swansea

Other museums and sites *(this list is illustrative, not comprehensive)*

- Aberdulais Falls
- Afan Argoed Mining Museum
- Angidy Furnace / Valley
- Bedwellty House
- Bersham Ironworks / Heritage Centre
- Blaenavon Ironworks
- Blaenavon World Heritage Landscape
- British Waterways (various sites)
- Caerphilly Castle
- Cardiff Castle
- Castell Coch
- Cefn Coed Mining Museum
- Cefn Cribwr Ironworks
- Cefn Golau Cholera Cemetery, Tredegar
- Centre for Alternative Technology
- Chepstow Museum
- 'Copperopolis', Hafod (Swansea)
- Cyfarthfa Castle
- Cyfarthfa Ironworks
- Dolaucothi Gold Mine
- Grove Colliery
- Dowlais Ironworks
- Dyfi Furnace,
- Electric Mountain, Dinorwig
- Ewenny Pottery Visitor Centre
- Ffestiniog Railway
- Gadlys Ironworks
- Glynn Vivian Art Gallery
- Hafod Trust

- Kidwelly Industrial Museum
- Kilgetty Ironworks
- Llechwedd Slate Quarries
- Llywernog Silver-Lead Mine Museum
- Minera Lead Mines
- Neath Abbey Ironworks
- Other 'Great Little Trains of Wales'
- Parys Mountain
- Penrhyn Castle
- Plwm - the Heritage of Ceredigion's Uplands
- Pontcysyllte Aqueduct World Heritage Site
- Pontypool Museum
- Pontypool Park
- Rhondda Heritage Park
- Swansea Museum
- Swansea Community Boat
- Thomas Telford Centre (Menai Bridge)
- The Works, Ebbw Vale
- Tintern Old Station
- Wye Valley AONB

Other organisations *(this list is illustrative, not comprehensive)*

- Community councils
- Community associations
- Local authorities
- Local libraries and archives
- National park authorities
- Regional tourism organisations
- Visit Wales

There are also many organisations and projects established through a variety of funding mechanism that could participate in implementation of this plan. They include:

Landscape Partnership Schemes

- Overlooking the Wye – Wye Valley
- Forgotten Landscapes – Blaenavon
- Heather and Hillforts - Denbighshire
- Tywi Afon y Oesoedd - Llandeilo

Community development initiatives

- Adventa – Monmouthshire
- Antur Stiniog - Blaenau Ffestiniog
- Cadwyn Clwyd - Flintshire
- Planed – Pembrokeshire

6 Interpretive aim and objectives

We propose that the aim of interpretation which stems from this plan should be:

- To encourage people to understand why and how the Industrial Revolution came about, who were responsible for driving it at all levels, what were its key components, where in Wales did it flourish and what is its legacy.

6.1 Interpretive objectives

To support the aim, we propose that the interpretive objectives should be:

- To encourage visitors and residents to consider how people in Wales developed, adopted and adapted methods and material in a continuing search for better products and consequent standard of living.
- To help visitors and residents to understand that the Industrial Revolution in Wales was not a single event, but was an evolutionary process based on individual pioneering efforts that took full advantage of the country's natural resources.
- To help visitors and residents to appreciate the impact that the industrialisation of Wales had upon the global economy through the import and export of materials and products, and the transfer of skills, techniques and knowledge.
- To help visitors and residents to understand how the improvements to the early steam engine and to the casting of iron were the two key developments that enabled the Industrial Revolution to reach its peak.
- To help visitors and residents to understand how natural resources and availability of labour combined with greater affluence, political stability and mechanical invention led to the Industrial Revolution's development in Wales.
- To help visitors and residents to understand the motivation of inventors, investors, entrepreneurs and working people which combined to make the Industrial Revolution in Wales a matter of international renown.
- To help visitors and residents to appreciate how industrial society grew physically and socially from the days of inequality of opportunity and wealth to the present day where most people in Wales enjoy a reasonable level of prosperity and comfortable living.
- To help visitors and residents to appreciate the part by the Industrial Revolution in sustaining, enhancing and extending Welsh language and culture as a result of Welsh-speakers from rural Wales moving into the close-knit communities in the industrialised areas of (principally) south Wales.
- To help visitors and residents to understand the role played in the development of a more equitable society in Wales by political activists and workers', leaders and how that role manifests itself in contemporary society.

- To encourage visitors and residents to explore Wales and to see the evidence of the Industrial Revolution from the present-day landscape, quarries, railways, canals and docks to great houses, cities and towns and valley communities, working men's institutes, industrial museums and reclaimed landscapes.
- To encourage visitors and residents to develop their interest in the Industrial Revolution, its growth and transformation into post-industrial society and to appreciate how much of that process is relevant to their own lives.
- To encourage visitors and residents to appreciate the actions of many entrepreneurs in improving the lives of their workforces and health of the community as a whole and, at the same time, to recognise that social progress was largely a result of the determination of working people to achieve better working and living conditions.

7 Interpretive themes

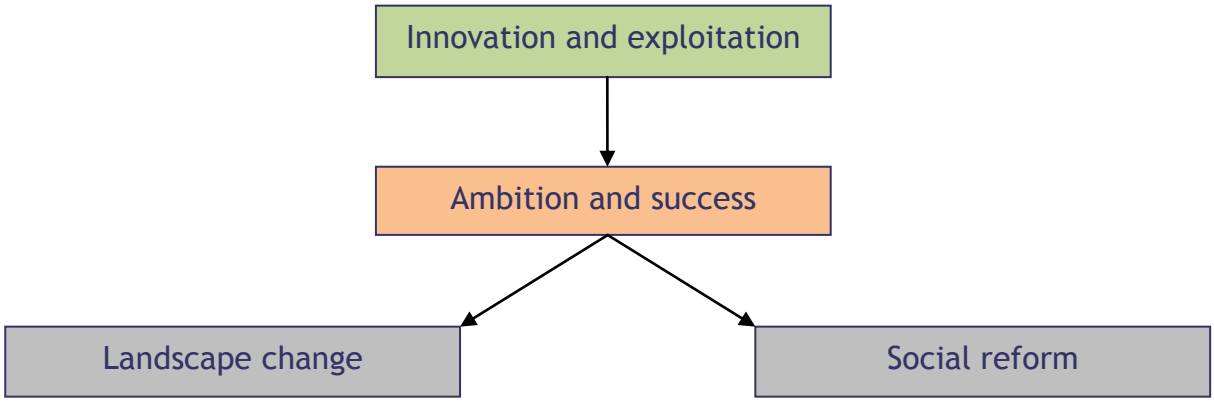
Themes are effective

Effective interpretation is based on themes. A theme is a central or key idea that a visitor should be able to remember and summarise if asked. The development of a theme therefore provides organisational structure and clarification of understanding. [Cadw]

Themes provide a framework for interpretation. The themes for interpreting several centuries of *Ysgogiad / Driving Forces* were introduced in the foreword:

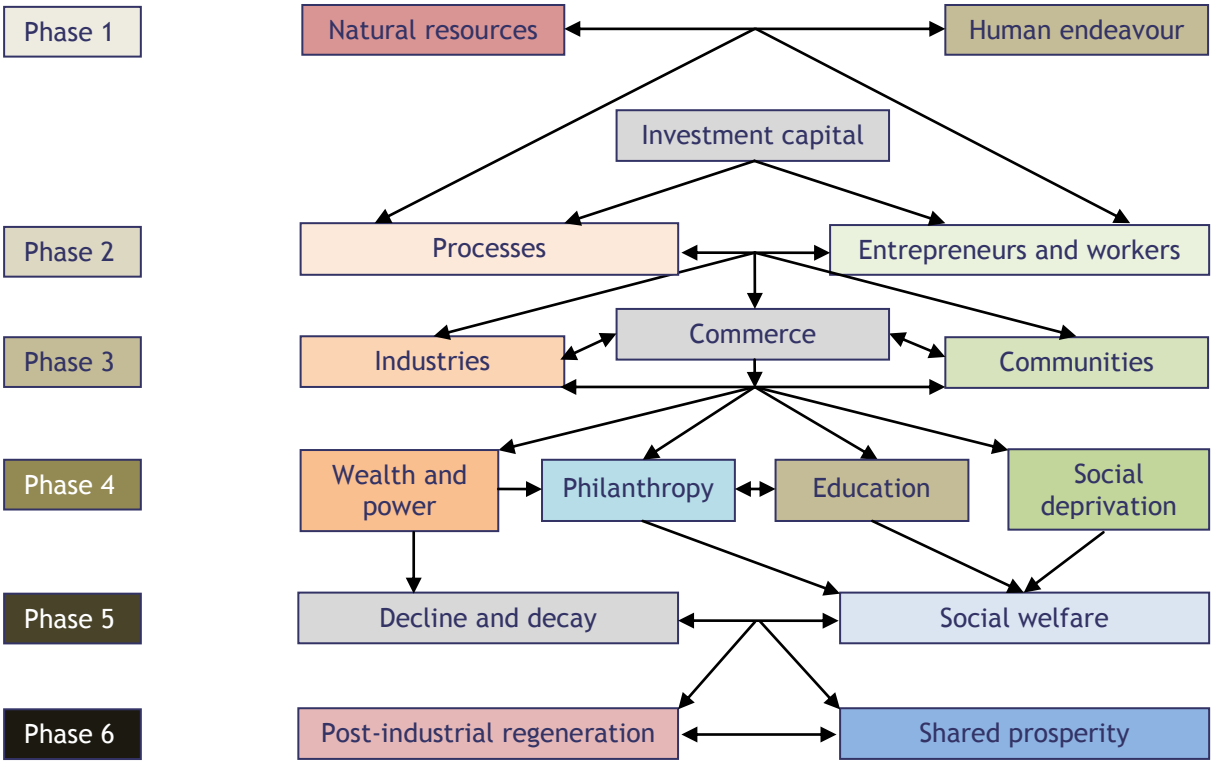
- **Innovation and exploitation** – from the start of the Industrial Revolution, people in Wales maximised natural and human resources for economic and social betterment through adopting and developing new processes, products, transportation methods and trading opportunities.
- **Ambition and success** – armed with natural resources, technical developments, expanding markets and personal aspirations, entrepreneurs and working people in Wales exploited every opportunity to increase their wealth, education and social position from the achievements of the Industrial Revolution
- **Landscape change** –the Industrial Revolution created widespread and irrevocable changes to the landscape to provide sites for extraction, manufacturing, transport, housing and administration, and today's landscape reflects the transformation of an agricultural landscape to an industrial one and still has an impact upon how many people in Wales live and work.
- **Social reform** – the industrial and commercial achievements of entrepreneurs in Wales brought prosperity and opulence to the few but poverty and deprivation to the many which motivated individuals and groups to seek improved conditions and personal betterment for working people, and representation of their interests.

The inter-relationships among the four themes can be represented as a diagram:



Similarly, the various elements of the narrative can be represented in a diagram which represents the six phases of the Industrial Revolution:

- The pre-Industrial Revolution period
- The formative period of the Industrial Revolution
- The developmental period of the Industrial Revolution
- The high-point of the Industrial Revolution
- The waning of the Industrial Revolution
- The post-Industrial Revolution period



7.1 Sub-themes

The four themes can be supported by a number of sub-themes which reflect many elements of the six phases illustrated above. For example

Innovation and exploitation

- The Industrial Revolution had its origins in prehistory when people first discovered how to work with metal and simple mechanisms.
- In the late mediaeval period, many small extractive and manufacturing enterprises developed in Wales using, principally, water and people power and acting as forerunners for full industrialisation.
- Advances in making iron, and the improved design of the steam engine, were the twin springboards for the most dramatic period in the Industrial Revolution.
- Much of the output of the Industrial Revolution in Wales was produced by small-scale, rural and traditional activity throughout the country in addition to the products of the major enterprises.

- Wales was principally a producer of primary materials and products for national and international markets and exported slate, coal, iron, steel, copper, tinplate etc around the world
- Wales was a hotbed of innovation during the Industrial Revolution, attracting and encouraging many inventors, engineers and other industrial pioneers to create world-leading advances in technology, transportation and building techniques.
- Invention and innovation in Wales didn't end in the nineteenth century but continues to this day as researchers, scientists, technologists and entrepreneurs devise and develop new processes and products.
- Wales was fortunate in having substantial and neighbouring deposits of coal, iron ore, limestone and clay, as well as deposits of other metals, slate and stone, and a native population that could no longer be sustained by agriculture.
- Notwithstanding the efforts of the entrepreneurs, it was 'people power' which made the Industrial Revolution happen in Wales – they were exploited as much as the natural resources until social reform began to play a part.

Ambition and success

- The insatiable hunger for wealth and power led to the exploitation of land and people in Wales throughout the whole Industrial Revolution.
- Ambition still motivates people in the fields of science, technology and industry but within a Welsh society where there is much greater equality of opportunity
- The profits from extractive and manufacturing industries, and from land and sea transport, brought financial and social success to entrepreneurs and merchants who used their wealth to build and furnish castles and great houses.
- The Industrial Revolution also brought wealth and status to industrial and commercial cities and towns in Wales.
- Ambition drove many working people, whose families had worked the land, to seek better wages and conditions and this brought irrevocable changes to many communities
- The desire to escape the tyranny of poor working and living conditions encouraged many working people to seek self-improvement through education provided through community effort
- Not all successful entrepreneurs were national figures; many local enterprises were established all over Wales and contributed to the Industrial Revolution
- Many entrepreneurs, and their families, provided substantial funds for charitable and social purposes in Wales including education of children and working adults.
- In recent times, Wales has become a recognised source of expertise in reclamation of environments damaged by the coal and iron industries.

Landscape change

- From the earliest days of the Industrial Revolution in Wales, the landscape began to change to accommodate extractive and manufacturing industries, transportation routes, housing for working people and civic infrastructure.
- The topography of Wales was a constant challenge to people establishing and operating industrial enterprises and resulted in many innovative solutions to harness nature rather than be constrained by it.
- Much the changed landscape remains to this day, particularly in terms of cities and towns, transportation infrastructure and residential areas, with changes continuing to take place as economic and social activity progresses.
- Although a great deal of industry was latterly concentrated in south Wales, much of it developed in mainly rural communities, some of which grew into urban and industrial landscapes.
- Many footpaths in and around industrial communities were originally created by people commuting from the small holdings and other homes to the workplaces in towns and villages.
- Most, but not all, of the former industrial sites for extraction and primary manufacturing have been completely reclaimed and are now used for commercial, residential and leisure purposes.
- Some of the major extractive and manufacturing sites, and ports, remain in use and others have been preserved as museums to tell the story of Wales as the first industrial nation.

Social reform

- The Industrial Revolution in Wales drew in a wide diversity of people who, in a relatively short time, created a thriving and coherent society.
- Jobs with better pay than in agriculture, opportunities for the whole family to work, a company house and additional skills lured people to work in dangerous and unhealthy conditions in the 'new' industries.
- The rise of the middle classes and the 'consumer society' with money to spend, creating markets for new goods and possessions made from the products of Welsh industry.
- Working people in Wales, the other 'wheels' of industry, despite better pay than they might have experienced in agriculture, suffered considerable deprivation and lack of representation for many generations and this led to social unrest, organisation of labour and frequent confrontation.
- The Industrial Revolution gave rise in Wales to new groups such as the trade unions, the cooperative movement, Miners' Institutes, Working Men's Clubs and the Workers' Educational Association, as well as wide support for non-conformist denominations of the Christian church.
- The need for a constant supply of fit and healthy labour encouraged immigration from other parts of Britain, Ireland and from Italy and many other countries in

Europe and later from former colonial territories resulting in a multi-cultural society particularly in the cities such as in Tiger Bay, Cardiff.

- The exploitation of working people led to constant agitation by reformers which resulted in universal suffrage, greater workers' representation, improved education and the welfare state
- As the Industrial Revolution came to an end in Wales as elsewhere, with shrinking labour forces and the search for new industries, prosperity became more equitably spread
- In the post-industrial era, Welsh society is still changing as people adapt to the demise or 'down-sizing' of traditional industries and new forms and places of employment take their place.
- The Industrial Revolution maintained and developed the special qualities of Welsh language and culture through self-education, the arts and religion, leading to a unique and vibrant culture of poetry, music and Welsh-language publishing.
- An important part of the cultural legacy of the Industrial Revolution in Wales is the pride people have in the achievements of their ancestors and families.
- Industrialisation has had a profound effect upon the development of today's strong and lasting Welsh cultural identity.

8 Markets and audiences

The physical package of sites and landscapes which support the story of Wales as the First Industrial Nation are, in the main, existing 'industrial heritage' attractions. However, it is a product augmented by the traditional events, activities and cultural echoes which still reverberate throughout Wales. Despite evidence of growth in visits to industrial heritage sites (English Heritage research 1998 showed that visits to industrial sites had grown by 21% over a seven year period), recent marketing trends have tended to avoid the term 'industrial heritage' and it has become very much part of a wider cultural tourism product.

Of the nine million visitors who each year currently enjoy Wales, around one million are from abroad, representing not only a significant market sector but also one that, in general, has an expressed interest in finding out about the country, its scenery, heritage, language and ancestors.

VisitWales welcomes all visitors, including those whose interests lie mainly in spending time, usually in modestly-priced accommodation, at the many coastal resorts. However, it is keen to attract many more of what it calls 'independently-minded' families – those who will seek out the special and often unique qualities of Wales including its industrial heritage.

Discussions with tourism marketing and other organisations reveal more about the nature of the market, particularly for cultural tourism in Wales. Research carried out by the North Wales Tourism Partnership, for example, found that:

- **29% of tourists** visited for a specific cultural activity and are the 'pure cultural tourists'. They are well prepared, they will have read information before their visit and know what they are coming for. They will visit specific sites or attractions for a purpose and will be focused in their visit itinerary. They visit for cultural enlightenment, as well as for entertainment. They tend to be older adults only.
- **70% of tourists** are 'casual cultural tourists' or 'accidental cultural tourists'. For casual cultural tourists the cultural context is important but so are other non-cultural factors. The destinations must have a variety of opportunities for activity and must include some shopping. Their purpose for visiting is for general interests with some cultural activity included. They are generally adults only or with older children.

'Accidental cultural tourists' pay little attention to specific cultural aspects before deciding where to go but are still interested in visiting a cultural site if it is within the area of their general visit. They will not have researched much before their visit and are happy to pick up information on the way that may encourage them to visit other attractions. They tend to be adults-only groups or families with older children.

The largest group of 'cultural' tourists are adults travelling as couples or in groups. They are mostly aged 35+ with or without children and in social groups A, B and C1.

This research also showed that the internet is now the most dominant source of information for finding out about destinations, and it's used by people of all ages. People may start by searching tourist board sites but are comfortable using search engines for accommodation and independent review sites. An individual event may be the driver for planning a cultural visit but the general cultural backdrop for the destination is important for making a visit decision.

Other organisations consulted provided more anecdotal information about the market. Some people enjoy taking tours with specific topics – gardens, churches, industrial heritage or other cultural topics – but most people are more relaxed about their visits, picking off destinations on a whim rather than as an organised visit. People who come to an area for another purpose are often interested in organised tours if they are available. During the Ryder Cup in 2010 many visitors, particularly from America, joined tours with a variety of topics.

Websites are increasingly drawing the interest of potential visitors. Sites that carry more of an explanation of culture, rather than simply information, are particularly useful.

The term cultural tourism is useful in that it suggests more than just structures, or features, instead indicating that people and how they live(d) are at the core of the product. This fits well with the people based approach suggested in this plan. The section below looks at the markets and audiences for this product.

8.1 Markets

While the banner of cultural tourism is useful, in order to understand the current position with regards to the appeal of the story of Wales as the first industrial nation, we need to see how industrial heritage attractions have and are performing. The tourism market in many former industrial areas of Wales relies heavily upon the internal domestic market as well as visitors from the M4 corridor and the English Midlands. Unlike seaside resorts, cities and rural areas, industrial communities such as the Valleys also have a very large 'visiting friends and relatives' market and, as such, local people often explore their home grown treasures when accompanying their visitors.

The proportion of day visitors is high at industrial attractions, again reflecting the provenance of the visitors. Recent work undertaken by Beaufort Research for Cadw bears that out. At Blaenavon Ironworks, 61% of visitors are day visitors (the highest at all the Cadw sites surveyed) and it also has a significantly higher proportion of Welsh visitors too (8% more than its nearest 'rival'). Most interestingly, it seems that sites such as Blaenavon also appeal to a wider demographic range, with 9% more visitors from the DE socio-economic bracket than any other Cadw site (although it was mid-range in terms of C2 visitors) and attracted more disabled visitors than any other site too.

This, coupled with research Beaufort undertook into under-represented visitor groups (again for Cadw), suggests that sites representing the more recent past are easier for people to relate to than, say, medieval palaces. Interestingly, Blaenavon also scored highest in the overall satisfaction survey of visitors to Cadw sites. The research does also suggest however, that industrial sites tend to appeal to couples

rather than families. This balance may well be readdressed by injecting more of 'people stories' in to how these sites are presented.

Figure for 2009/2010 for Aberdulais Falls showed that most visitors fell in to the socio-economic categories of B or C1. Interestingly, the National Trust have now abandoned socio-economic profiling in favour of segmentation which allows them to *look at the level of interaction visitors want, the elements of a visit that are important to them, and how to present these in the most accessible way*[13]. A list of the market segments developed by the National Trust is attached as Appendix C.

Big Pit's visitor profile is interesting as it sees the most education visits of any National Museum site, as well as seeing the highest number of overseas visitors. This may be because coal is so iconic in people's perceptions of Wales. Comparatively, it has a similar socio-economic profile to most of the other Nation Museum sites (many of which are industrial) – the exception being Cathays which tends to attract more ABC1's.

As Big Pit and the table below illustrate, the education market is important to industrial sites too. Many sites are catering to key stage 2 of the National Curriculum and tying in with other aspects (eg, not just history, but citizenship, science and technology, art etc). The Welsh baccalaureate is another school-based study stage that can and has used industrial heritage. Big Pit also achieves great success at attracting overseas school groups. Further / higher education establishments and adult learners are also key education markets for industrial heritage sites.

In more general terms, the type of visitor that industrial heritage typically appeals to has been segmented as follows:

Market segment[14]	*Of little or no importance*	*Quite important*	*Very important*
Tourists and day-trippers with little or no interest in industrial heritage	28%	46%	26%
Tourists and day-trippers keen to learn more about industrial heritage	16%	23%	61%
Enthusiasts / interest groups already well-briefed on the site and its history	19%	26%	55%
Foreign/overseas visitors	35%	42%	23%
Education groups	24%	19%	57%

This leads to the consideration of the importance of the enthusiasts, and here this term does not just mean the many and varied heritage and history societies that abound and are a useful source of visitors, but also those who are happy to visit a site because it has a particular type of locomotive or machine, or demonstrates a particular process which has a strong draw for them. At the moment, we are still in that stage of post-industrialisation which means that even where industries have gone, often those who worked in them are still around to reminisce, or their

[13] Source: The National Trust

[14] Source: The Market for Industrial Heritage in the UK, Insights , Jan 2000,

children are able to recount how 'mam' talked about working in the canteen, and 'dad' remembered tapping the steel etc. This personal draw is another reason why people can often relate closely to industrial sites.

Just as important as who visits, is who doesn't, and the Cadw research suggests that barriers include apathy (this is strong amongst local markets who think 'I can always go tomorrow'); perceived cost (often the perception is worse than the reality); issues around value for money (eg, cost compared to time / value from the visit) and a perceived lack of suitability for families. It was also felt that there could be improvements in how, who to and where sites were marketed.

8.2 Audiences

As seen above, the markets for Wales as the first industrial nation are varied and complex. Audiences as such would/could include:

- The independently-minded family, attracted to Wales (or to parts of Wales away from home) at least partly by its scenery, *and with at most a passing interest in, and knowledge of*, the industrial story of Wales.
- The independently-minded family, attracted to Wales (or to parts of Wales away from home) at least partly by its scenery, *and with an expressed or strong interest in, or knowledge of*, the industrial story of Wales.
- Adult visitors and residents *with at most a passing interest in, and knowledge of*, the industrial story of Wales.
- Adult visitors and residents *with an expressed or strong interest in, or knowledge of*, the industrial story of Wales.
- Visitors with a special interest in the industrial story of Wales,
- Local people with an interest in the industrial story of Wales/ aspects of the story which are relevant or personal to them (again across the socio-economic spectrum)
- Visitors with family/friends in Wales and who therefore have an interest in aspects of the industrial story relevant to their hosts or personal family history.
- Educational groups

Interpreting for such a variety of audiences is a tall challenge. In Chapter 10 we identify some mechanisms for tying together the many sites/landscapes and facets of the *Ysgogiad / Driving Forces* story. How these are executed in real terms for the various audiences will need careful consideration. Cadw (Atkins report) suggests that it is aiming to attract a more general family orientated audience in the main, and as such media at individual sites should reflect this.

However, wherever it is practicable to provide a hierarchical approach, different types of interest can be addressed at different levels.

9 Our proposals

A people-based approach

All revolutions involve people as leaders or followers, beneficiaries or victims and the Industrial Revolution was no different. To give a people-focus to the chosen themes, we have selected a number of key players in the Industrial Revolution, those who represent the *Ysgogiad / Driving Forces* and whose contributions can act as a conduit for the overall narrative. Even the short list is long – the narrative is a complex one and over-simplification will result in losing key threads in the intricate web of factors that go to make up the Industrial Revolution in Wales.

It was the people who had the motivation, the resources, the ambition and the opportunities to exploit the Industrial Revolution, in both land and workforces. It was also people who fought against exploitation of their peers and fought – successfully in the end - for better conditions and full representation.

We have identified many of the key players in the story in two diagrams:

- The innovators and entrepreneurs
- The social reformers, representing the working people.

In the case of the first list, the selected people are shown against the processes or products for which they are best known and the places associated with the people and the processes where there is still something to see, either as a site, structure or visitor attraction. In the case of the second list, the selected players are shown against the activities in which they engaged and the places associated most with these activities. In many of the places there are structures or buildings to see; in some cases they are simply communities.

The content of the two charts provides an initial 'menu' for anyone who may wish to tell all or parts of the overall story of the *Ysgogiad / Driving Forces*. In any circumstance, where the overall narrative is being related to local circumstances, there will be other people to add to the story, those whose contribution may not have been 'national' but was vital to the particular place and the process. We say more about how the story may be told in Chapter 10.

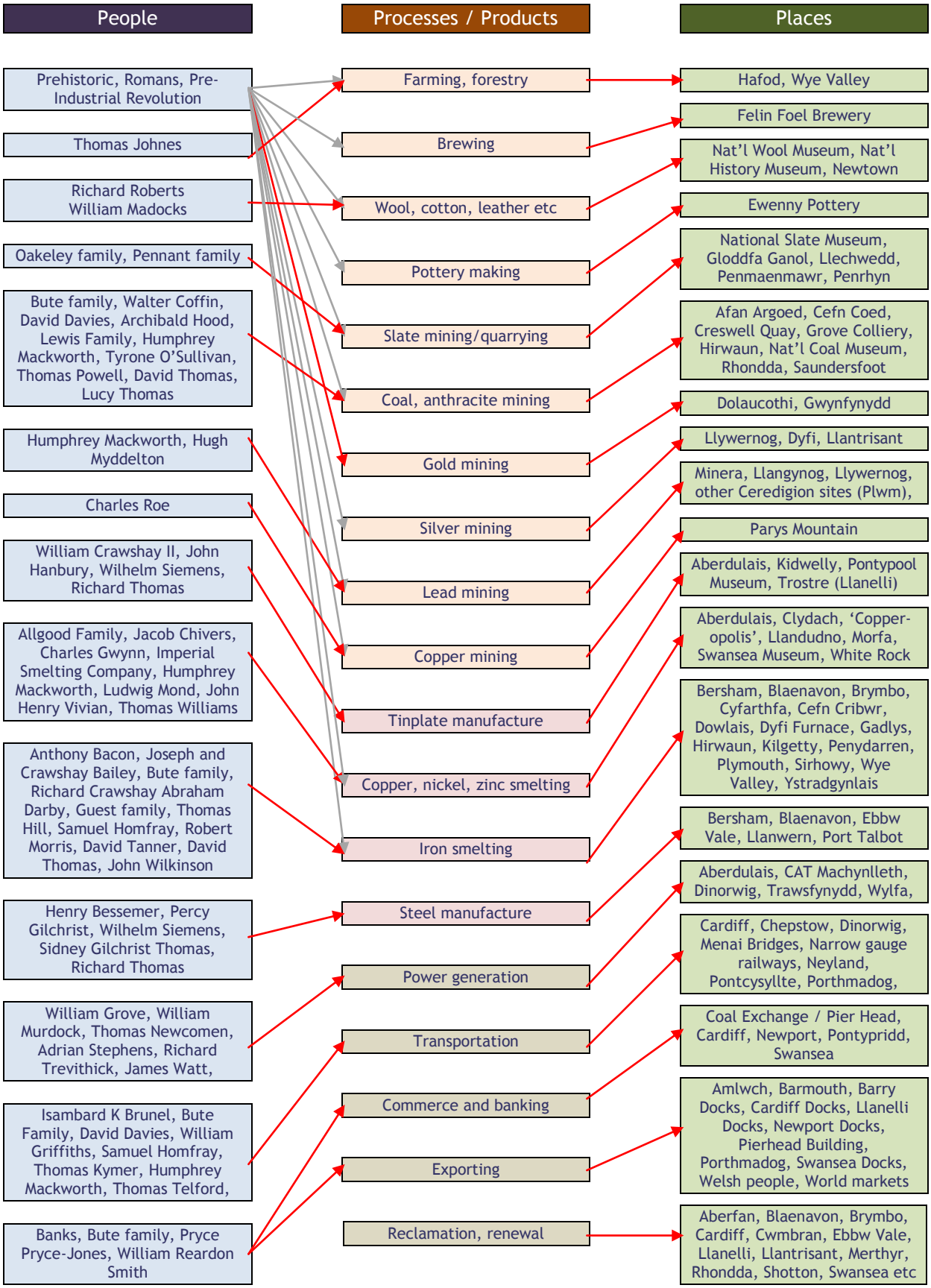
More detail about each person, process or activity and place is given in Appendix D.

Places

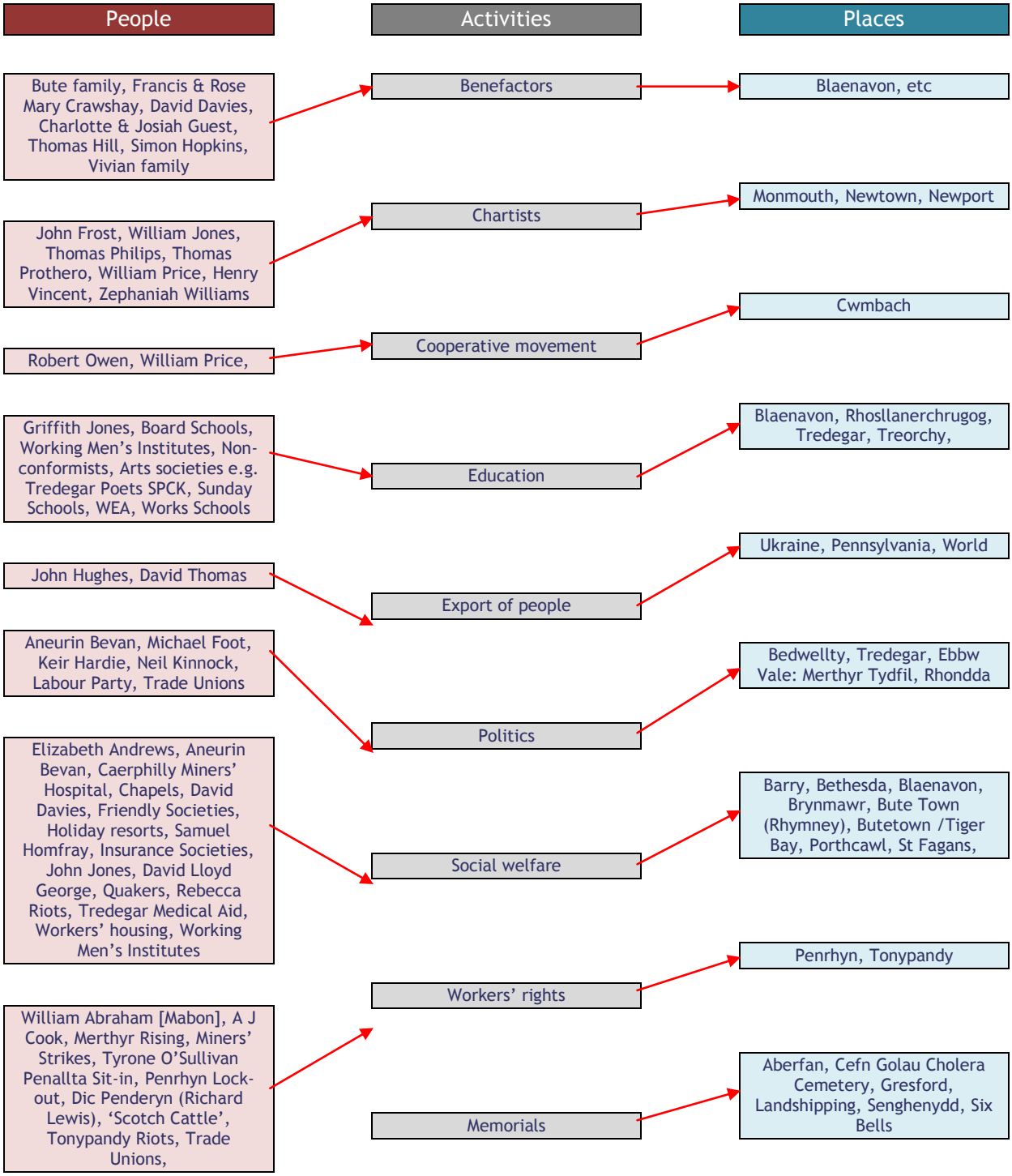
The places noted are a selection of examples and do not constitute a wholly comprehensive list.

All the topic-based national museums are shown on the diagram on the next page. However, because of their broad scope of content, the National Museum Wales and the National Waterfront Museum are not named against all the processes and people to which their collections relate. Their contribution to telling the story is considerable, they cover a wide range of topics and they should be key destinations for those interested in all or part of the overall story of the Industrial Revolution in Wales.

Innovators and entrepreneurs



Social reformers / representatives of the working people



This diagram, our interpretive objectives and the interpretive themes mask the emotion and fear, the pride and the passion, the triumph and tragedy, the riches and poverty, the beneficence and the misery – all these and more than were encompassed by Wales' Industrial Revolution. It is for those who implement interpretation arising from this plan to bring in these very human characteristics.

10 Interpretive mechanisms

The brief does not require us to make detailed proposals for interpretive media to tell the story of the *Ysgogiad / Driving Forces*, the Industrial Revolution in Wales. Rather, it asks that we propose interpretive themes that are focussed on presenting the stories to a broad audience base from those with specific interests to the family holiday market and to consider the potential for attracting new audiences.

People are most strongly engaged by stories of other people, the things they have achieved and how, and their working and domestic lives – all the things they can relate to, and compare with, from the own knowledge and experience.

Our four themes, with the supportive sub-themes, which are set out in Chapter 7 encapsulate these stories and more and, if used to the full, will allow those who implement interpretation to tell stories of the Industrial Revolution not only through the people – both individuals and groups – but also through the things that people tend to be interested in, such as:

- Where did all the workers come from, for example:
  were they all from rural parts of Wales?
  why did they come to work in industry when they could be working on farms?
  did they all speak Welsh?
  were there any immigrant works and where did they come from?
  where did they live?
  how can I find out about my own family?
  [cf Theme 1 and sub-themes, Innovation and exploitation]
- How things worked – tools, machines and technology and how they undertook the tasks they were set; for example:
  how did they build a canal through hills and valleys?
  how did they separate iron from its ore in furnaces?
  how did the steam engine work?
  how did mineshaft headstocks work?
  [cf Theme 1 and sub-themes, Innovation and exploitation]
- What kind of things were made and for what were they used; for example:
  were the iron, steel, copper and tinplate made into products in Wales?
  what products were they used to make and where?
  which countries were the biggest export markets for coal?
  which were the biggest ports?
  [cf Theme 1 and sub-themes, Innovation and exploitation, and Theme 2 and sub-themes, Ambition and success]
- What kind of conditions did people work in, for example:
  was there any provision of health and safety?
  why did people come and work in such conditions?
  did children really work down the mines?
  did women really do manual labour?
  [cf Theme 1 and sub-themes, Innovation and exploitation]

- Who were all the bosses and how did they live, for example:
  were the people who started the businesses Welsh?
  why did they come here to start their businesses?
  did they build great houses for themselves?
  were they good to the workers and the community?
  are their companies still going or has everything closed down?
  [cf Theme 2 and sub-themes, Ambition and success]
- Where was all the industry located, for example:
  was all industry concentrated in south Wales, in the valleys and on the coast?
  were there smaller industrial enterprises in many parts of Wales?
  how many industries developed from traditional, rural crafts?
  how much evidence is there of this dispersed industrial activity?
- How did the places change, particularly in the Valleys, for example:
  what was there before the coal mines and ironworks?
  was Blaenavon Ironworks the biggest building anyone had ever seen?
  were there any planning laws in the eighteenth and nineteenth centuries?
  what has happened to all the spoil heaps?
  [cf Theme 3 and sub-themes, Landscape change]
- How did people work and live, particularly the 'ordinary people' rather than the rich; for example:
  how could a family live in one room?
  was there or where was the toilet?
  what were people paid, how much did things cost, where did they buy them?
  how did things change?
  why did unions start and what were the effects of social reform?
  [cf Theme 4 and sub-themes, Social reform]
- What were the important cultural aspects in the lives of working people; for example:
  how important was religion, and particularly non-conformism?
  how did the tradition of male voice choirs develop?
  how many children – and adults – benefitted from education and self-improvement?
  what was the impact on folk song and story, poetry and other arts?
  [cf Theme 2 and sub-themes, Ambition and success and Theme 4, Social reform]

10.1 The importance of context

The purpose of identifying interpretive objectives, themes, sub-themes and mechanisms is to encourage those with direct responsibility for presenting and explaining the story of the Industrial Revolution in Wales to integrate the wider, national story with the specific site- or process-related stories they have already taken. Few sites we have visited set their own story in the context of the Industrial Revolution as a whole, perhaps because of the fear of over-complicating the narrative, confusing visitors and losing their attention and interest.

However, it should always be possible to keep the overall context as a thread running through their interpretation, referred to specifically where apposite. No industry was 'an island', all depended on natural, financial and human resources, many depended on the work of other industries, for example, iron founding needed coal and limestone, stonemasons and bricklayers, tramways and carpenters, office workers and, of course, a labour force. Products needed carters, canals, railways and roads to get to market. Workers needed clothes and food ... and so on.

Inter-relationships and interdependencies were the order of the day and this web should always be part of any site or topic interpretation. Indeed, interpretation is not good interpretation without setting the story in context. It may offer challenges to interpreters but it must be tackled.

10.2 Media

Each site will choose its own interpretive media – most already have media in place, from websites and leaflets to exhibitions, digital equipment and guided tours. All are -suited to integrating the context with a site- or topic-based story.

We would propose, however, that a national body, working closely with Cadw, takes on the role of making available the national story, because the national story is one that deserves to be told as a whole, as well as – quite rightly – in parts, related to sites and topics. There are two ways we suggest this was done initially:

- A pan-Wales website
- via the People's Collection website
- A comprehensive book or booklet

A pan-Wales website

This website should present, simply and diagrammatically, the *Ysgogiad / Driving Forces*, the story of the Industrial Revolution as it created Wales as the first industrial nation. It should present layered interpretation so that different levels of interest from children to experts can be met, but to achieve greater penetration of both the narrative and the various audiences, it should act as a nodal point for other relevant websites to which it can relate, for example, those dealing with:

- People, groups and movements associated with the Industrial Revolution
- Processes and products of the Industrial Revolution
- The strong inter-connections between people, processes and places
- Activities concerned broadly with social reform
- Places associated with the Industrial Revolution such as remaining structures, buildings and landscapes
- National and other museums and sites
- Other industrial sites open to visitors
- Natural, historical, industrial, social and cultural topics related to the Industrial Revolution

- The regeneration and redevelopment of some former industrial sites

It is important that the website is 'layered' to suit the needs of different audiences from those with a specialist interest to the independently-minded family, a general audience and those with education needs.

The website should include an interactive map to help people to navigate, literally, from associated site to site, to see sites in the context of natural resources, for example, and in relation to each other.

It should be possible to download discrete parts of the website either in printed or digital form, in Welsh and in English.

The People's Collection website

This website, designed to 'bring together our nation's heritage', is sponsored by the Welsh Government. It embraces the widest range of sources of material about Wales and offers opportunities for people to access collections digitally and to contribute their own information. It could well incorporate a section on Wales as the first industrial nation alongside or part of existing sections.

A comprehensive booklet

Although there are many books on the Industrial Revolution as a whole and several which deal with aspects of it in relation to all or parts of Wales, there does not appear to be one book which treats Wales as a whole and its rise to be the first industrial nation. We propose, therefore, the production of a comprehensive booklet on the *Ysgogiad / Driving Forces*, the story of the Industrial Revolution, in parallel to the website. It should be designed as a series of simple illustrated diagrams with minimal next – rather like a composite 'interpretive map', so that it is more accessible to the family market.

It should be designed to present the story both diagrammatically and narratively, again leading the story with the people but making clear also the context in which they created and developed the Industrial Revolution in Wales, the processes, products and activities with which they were involved and the sites associated with the story. We believe this report provides a good basis from which to start.

We would expect such a booklet to meet educational as well as general needs, to address general rather than expert audiences but to provide adequate guidance on sources of detailed and specific information for those with a deep or specialist interest – including sources of information related to family histories and other material about the ordinary people as well as the innovators and entrepreneurs. It should be written in Welsh and English, either as one or two editions.

We would also expect such a booklet to be widely available through book outlets and at sites associated with the Industrial Revolution.

An alternative to the booklet would be a series of interpretive maps / leaflets designed to cover different aspects of the *Ysgogiad / Driving Forces* story and fully accessible to family audiences; however, this could make the presentation of the Industrial Revolution in Wales as a single concept more of a challenge unless they were very carefully prepared..

11 Potential partnerships

In relating the overall narrative of *Ysgogiad / Driving Forces*, the story of Wales as the first industrial nation, we would suggest that the potential partners in this endeavour will mirror closely those organisations we identified in Chapter 5. These include museums and industrial sites, local authorities, community organisations, tourism agencies etc. At this stage, no discussions on any form of individual effort or partnership have been held with any of them, or any others.

For relating the national story as a whole, and integrating it where appropriate with site- or topic based interpretation, the national museums and national library would clearly have a leading role:

- National Coal Museum, Big Pit
- National History Museum, St Fagans
- National Library of Wales
- National Museum Cardiff
- National Slate Museum, Llanberis
- National Wool Museum, Drefach Felindre
- National Waterfront Museum, Swansea

In addition, other national institutions which are potential partners (or sponsors) include:

- Cadw / RCAHMW
- Universities in Wales, via appropriate departments
- BBC and S4C
- Civic Trust Wales, (in connection with Open Doors Day and other volunteer-led events)
- Commercial publishers (in relation to the proposed book or booklet)
- Commercial companies with continued involvement in industries associated with the Industrial Revolution in Wales
- The People's Collection website.
- Special interest groups with interests in industries associated with the Industrial Revolution in Wales

For relating the national story to the story of their own site, and integrating interpretation of the overall narrative within site interpretation, the other museums, libraries, sites and organisations listed earlier (pages 14 to 15) could be involved individually or in some form of partnership. They include, but not exclusively, all the stakeholders in Chapter 5.

12 Monitoring and evaluation

As a precursor to monitoring and evaluation of interpretation, it is important to set targets and performance measures, not least to give yardsticks against which to judge performance. However, in the case of this interpretation plan, this presents a number of challenges:

Many of the proposals in the plan relate to actions and activities which cannot easily be measured. For example:

- This plan deals with broad principles and is intended to lead to interpretive provision only indirectly
- References to *Ysgogiad / Driving Forces* in tourism promotional material may encourage visitors to specific areas and sites, some of which will have no formal admissions perimeter and those which do are unlikely to undertake sufficiently detailed research to distinguish which media encouraged which visitors.
- The manner in which a variety of organisations may implement all or parts of this plan is likely to be extremely varied, to include as target markets visitors and / or residents, and to be linked to, or integrated with, other activities which will make largely impossible any monitoring and evaluation, in isolation, of the plan's effectiveness.

There appears to be no detailed knowledge of tourists' (or residents') interests or detailed evaluation of their intellectual satisfaction from visits to specific or generic sites. Motivations and principal attractions are surveyed but they are so general as to be of little assistance in the case of this plan and its implementation.

Monitored sites

Where specific visitor sites are involved, such as museums or industrial heritage sites, then there would be opportunities to monitor and evaluate the effectiveness of the plan – to a degree - although even there, disaggregating the *Ysgogiad / Driving Forces* element from other motivations and satisfactions will present challenges of their own. Where the plan forms a part of other activities, it may be possible to attribute any success to the impetus provided by the plan or to specific elements within it.

However, where new interpretive media are created and installed, whether in physical or digital form, then there are mechanisms for judging their success which should be put in place. These include.

- Pre-testing of new interpretive media from graphic panels, installations, printed material, websites and digitally-downloaded material.
- Monitoring of the use of such interpretive media (including use by different audiences and those with accessibility challenges).
- Evaluation of the use of different media.
- Evaluation of the interpretive approach as a whole.

There are many methods that can be used to undertake each of these activities and we identify a number of them below. The list is not exhaustive but indicates some of the methods that can be employed to take stock of different elements of the interpretive approach. Wherever possible, pre-change data should be obtained in order to provide for immediate comparisons and to establish base lines of 'graphs' for continued monitoring and evaluation.

12.1 Pre-testing

Pre-testing is something that many organisations fail to do because 'deadlines' are cited as the need to get things on the ground, or out in the public domain. On the principle of 'getting it right, rather than getting it now', we advocate strongly that Cadw, and its partners in implementing this plan, test out new media before committing final expenditure and implementation work. A further benefit of this approach is in ensuring that the local community is given a chance to feed into the development process both by commenting and by participating.

In terms of printed and similar material, this process is now simpler and cheaper with the availability of computer-derived artwork that can be produced inexpensively and, in the case of printed material, easily circulated. In the case of interpretive panels or similar media the artwork can be laminated to last for the brief period necessary. Reactions can be sought from selected or random users / viewers, from 'focus groups' or otherwise chosen groups of people, or by other means that ensure wide pre-implementation appraisal and approval.

With any sound stores, or downloaded audio / video tours, sample scripts or 'sound bites' should be tested by visitors and residents over a period to ensure, as far as possible, that they meet their expectations of a visit as well as promoting the promoter's aspirations. The same applies to websites, DVDs etc.

12.2 Monitoring

Once media are in place, then monitoring their use and / or success can be done in a variety of ways, often in conjunction with evaluation. For example, the following largely quantitative checks could be instituted:

- Maintaining accurate checks of questions asked – and the type of questioners – as well as of material issued and advice given at tourist information centres and site admission points
- Maintaining accurate records of printed material distributed and replenished
- Maintaining accurate records of publications issued, website 'hits' and material downloaded, audio / video tours downloaded and comments made etc
- Making observation of visitors' and residents' use, behaviour, time spent etc when viewing specific and installed media
- Making observation of visitors' use of printed material
- Maintaining records of number of visitors to key sites and special events.

12.3 Evaluation

The more time-consuming and, therefore, costly, aspects of the work of appraising success are those that involve qualitative research, which can include:

- Face-to-face interviewing of visitors (and residents) at key sites, using interpretive media and / or attending events or guided walks / tours / trips
- Distribution of questionnaires for self-completion
- Use of focus groups, private and public meetings etc.
- Analysis of questions asked and answered (or not) by visitors at tourist information centres and key sites
- Analysis of unsolicited written communications by email, letter or otherwise

The depth of analysis of visitors' and residents' perceptions and reactions goes beyond any conventional tourism survey which seldom if ever cover interpretation, although many comments may have a bearing upon interpretation, or the lack of it. However, evaluation of this plan's implementation would make a suitable subject for a piece of more academic research.

Few organisations undertake any or more limited monitoring and evaluation of interpretation and only occasional pre-testing is undertaken. In a commercial environment, such appraisal of the potential success, as well as actual success, of a product would be undertaken as part of the overall marketing function. The same should be done by any organisation responsible for spending substantial sums on activities of public benefit.

Pre-testing, monitoring and evaluation will provide essential data and anecdotal material that will inform the development of the interpretive approach and guide it throughout its implementation over succeeding years. It is recommended that Cadw and its partners dedicate appropriate time and resources to the evaluation process in order to determine those initiatives that are successful in developing and maintaining the audience for *Ysgogiad / Driving Forces*. This will help to ensure that resources can continue to be effectively targeted.

13 Appendices

The following appendices are referred to in the text:

- Those consulted
- The brief in full
- People, processes / products, activities and places

Appendix A: Those consulted

Dr Judith Alfrey, Head of Regeneration and Conservation, Cadw

Dr Huw Bowen, Professor of Modern History, Swansea University

Matthew Griffiths, Director, Civic Trust Wales

Peter Lloyd Harvey, Proprietor, Llywernog Silver-Lead Mine

Gwilym Hughes, Chief Inspector of Ancient Monuments and Historic Buildings, Cadw

Dr David Jenkins, Senior Curator of Industry, National Museum Wales

Richard Keen, independent expert

Emyr Morgan, Director, Blaenavon World Heritage Site

Frank Olding, Heritage Officer, Blaenau Gwent CBC

David Penberthy, Interpretation and Lifelong Learning Manager, Cadw

Keith Rees, Demonstrator, National Wool Museum

Dafydd Roberts, Curator, National Slate Museum

Maria Rocke, Project Officer, Kidwelly Industrial Museum

Ifan Thomas, Demonstrator, National Slate Museum

Peter Wakelin, The Secretary, Royal Commission on the Ancient and Historical Monuments of Wales

Peter Walker, Mine Manager, Big Pit National Coal Museum

Ruth Waycott, Consultant, Wye Knot Tourism Ltd

Ann Whittall, Manager, National Wool Museum

Dr Eurwyn Williams, Royal Commission on the Ancient and Historical Monuments of Wales

Many books deal with all or parts of the industrial revolution in Britain and in Wales and we consulted a number of them in the course of compiling the report as well as making full use of the internet. The National Library, other libraries and the internet are excellent sources of information.

Appendix B: The brief in full

Wales – the First Industrial Nation Interpretation Plan

Cadw, the Welsh [Assembly] Government's historic environment service is seeking quotations to produce an interpretation plan for the stories associated with the theme *Wales - the first industrial nation*.

Context

After a major review of the interpretative provision at its 127 sites across Wales, Cadw is developing an overarching interpretation strategy for its estate. Cadw is also leading on the implementation of a significant Heritage Tourism Project, part-funded by the EU Convergence Programme. Consequently, Cadw is developing a pan-Wales Heritage Interpretation Plan.

The plan will focus on a number of chronological and/or thematic story strands which will create a cohesive picture of the story of the Welsh historic environment. One story strand concerns *Wales - the first industrial nation*.

People have been exploiting the natural resources of the Welsh landscape for thousands of years and evidence of this is still visible in all corners of the land. By the mid nineteenth century Wales had more people working in industry than agriculture. Using this definition, Wales can be called the first industrial nation. It was the motivations of the few and the exploitation of the many (and the resources in the landscape) that drove this move from agriculture to industry.

Cadw requires an overarching interpretation plan that charts this passage to an industrial nation. Usually, regional plans for interpretation of industrial heritage have perhaps been more focused on the story of industry itself. This plan should focus on people not industrial process. The plan will set out an interpretive framework upon which future detailed site and topic based interpretation plans can sit. This framework will be focused on people's motivations to invest in industry or to work in industry and the consequences of this on people and on the towns and landscape of Wales.

Examples of the motivations to move into industry include innovation and experimentation, exploitation of resources (and people), risk and entrepreneurship, investment and economics. The consequences were apparent in the transformation of much of Welsh society (often through workers and their families having to cope with hardship and suffering, but it is also important to understand what drove them to seek employment in industry). The consequences can also be seen in the often dramatic impact on the Welsh landscape, including the rise of industrial towns and ports.

These are the building blocks for a thematic interpretation of the rise of Wales as an industrial nation. All industrial growth can be linked to the stories of people their motivations and the impact their actions had. While the massive growth which took place during the 19th and 20th centuries will dominate the story, just as its traces dominate much of the landscape today, the plan should also acknowledge that the first steps in industrial development took place from prehistoric times and continued through to the early modern period which preceded the industrial revolution (about 1750).

Cadw is not seeking a detailed or comprehensive plan for the interpretation of all aspects of the vast and complex story of Wales as an industrial nation. The contractor will however need to be aware of the wider context in which their proposals sit and of the significance this aspect of Welsh history continues to have in contemporary culture and thinking.

Requirements

- Cadw needs an interpretation plan for the theme of *Wales - the first industrial nation*. The interpretation plan needs to:
- Identify the key elements of the story *Wales - the first industrial nation*.
- Propose strong overarching interpretive themes and sub themes that would be appropriate for related or complementary site, topic and area based interpretation plans.
- Be firmly grounded in historical fact.

- Propose interpretative themes that are focused on presenting the stories to a broad audience base, from special interest to the family holiday market. Note: information about the existing visitor profile will be made available by Cadw and relevant Tourism Partnerships; the potential to attract new audiences, including special and local interests, is also a factor.
- Be capable of bilingual articulation and also explain the relevance of Welsh language and culture to the themes where appropriate.

Output

Cadw requires an interpretative plan for *Wales - the first industrial nation* by **27th March 2011.** A 1st draft would be required for comment by early February 2010.

Deliverables

The consultant will need to:

- Familiarise themselves with the key sources and locations relating to the story strand and the interpretation and tourism developments relevant to the project. Information will be made available by the client, but the contractor may also need to obtain access to additional historical reference material. This will include site visits – a suggested but not exhaustive list is attached.
- Engage in dialogue and discussion with heritage and tourism interests relevant to the subject area and the locality. Engage in dialogue, liaison and negotiation with other organizations and/or consultants undertaking or who have already undertaken other interpretation or heritage promotion projects related to the industrial past of Wales.
- Work in association with experts relevant to the story strand.
- Embrace Cadw's conservation and interpretation principles.
- Meet with a steering group, led by Cadw and drawn from heritage and tourism interests, at agreed milestones during the commission and present the completed plan and recommendations to the steering group and, if deemed appropriate, an invited audience of sector interests.

Addendum

Whilst the plan, *Wales - the first industrial nation,* should detail overarching themes Cadw will also require specific and separate interpretation plans linked to these themes, for:

- Blaenavon Ironworks and its associated historic landscape,
- The slate industry of NW Wales,
- Swansea Bay and the Neath Valley. These will be advertised in the near future.

Suggested sites to visit

- National Museum Wales
- St Fagans, Cardiff
- National Wool Museum, Drefach Felindre, nr Newcastle Emlyn
- National Slate Museum, Llanberis
- Parys Mountain, Anglesey
- National Waterfront Museum, Swansea
- Copperopolis, Hafod, Swansea,
- Big Pit: National Coal Museum, Blaenavon
- Blaenavon World Heritage Landscape
- Bersham Ironworks
- Pontcysyllte Aqueduct World Heritage Site, Llangollen
- Llywernog Silver-Lead Mine Museum
- Electric Mountain, Snowdonia.

Cadw, October 2010

Appendix C: National Trust market segments

The following market segments are used by the National Trust:

Out and about

Spontaneous people who prefer chance encounters to making firm plans and love to share their experiences with friends.

Young experience seekers:

People who are open to challenge, in a physical or horizon-broadening sense They make and take opportunities in their journey of personal discovery.

Curious minds

Active thinkers, always questioning and making connections between the things they learn. They have a wide range of interests and take positive steps to create a continual flow of intellectual stimuli in their lives.

Live life to the full

Self-driven intellectuals, confident of their own preferences and opinions and highly independent in their planning and decision making; these people are always on the go.

Explorer families

Families that actively learn together, the adults will get as much out of their experience as the children. To fit in the interests of all family members planning, sharing and negotiation are essential.

Kids first families

Families who put the needs of the children first and look for a fun environment where children are stimulated and adults can relax; they're looking for a guaranteed good time.

Home and family

Broad groups of friends and family who gather together for special occasions. They seek passive enjoyment of an experience to suit all tastes and ages.

Appendix D: People, processes, activities and places

The following table provides more detail on the people, processes or activities and places listed in the diagrams in Chapter 9 and adds a number of entries not included in that chapter.

It is in three sections; the first two are divided in the same way as the diagrams in Chapter 9.

- Innovators and entrepreneurs / processes / places
- Social reformers / activities / places
- Examples of additional people / processes / activities / places

Wales – The first industrial nation: Innovators and entrepreneurs / processes / places		
Name of people	***Processes / products***	***Associated people / Processes / products / places***
People – Farming, forestry etc		
Prehistoric people onward	Agricultural revolution in 18th century led to displacement of many workers but also more productive farming, fishing and forestry	Hafod (Pontrhydygroes)
Johnes, Thomas [E, 1748-1816]	Estate / forestry / agricultural improver at Hafod	Hafod (Pontrhydygroes), John Nash
People – Brewing		
Prehistoric people onward	Beer was drunk widely by all ages from prehistoric times and was safer to drink than water in urbanised communities	Felin Foel Brewery, Llanelli Rhymney Brewery
John, David [EW, ?1837-]	Established Felin Foel brewery in 1878, first UK brewery to produce canned beer, helped revive tinplate industry	Llanelli
People – Wool, cotton, leather etc		
Prehistoric people onward	Wool has been used for clothing, coverings and other purposes since prehistoric times. As the population grew during the Industrial Revolution (and wars), the demand for woollen clothing, uniforms, blankets etc also expanded	National Wool Museum National History Museum Angidy Valley Newtown
Roberts, Richard [W, 1789-1864]	Engineer, invented the 'self-acting mule' in 1825 as major contribution to spinning industry; devised many other tools and machines	National Wool Museum
Madocks, William Alexander [E, 1773-1828]	Built planned village of Porthmadog and harbour, promoted woollen industry	Porthmadog
People – Pottery		
Prehistoric people onward	Pottery has been made since prehistoric times and remained a largely cottage industry until the Industrial Revolution when major potteries, serving industrial as well as domestic needs, developed; several well-known Welsh potteries	Ewenny Pottery Glynn Vivian Art Gallery National Museum
People – Slate mining / quarrying		
Prehistoric people onward	Slate, with its relative ease or working, was used for roofing from Roman times and increasingly in medieval times; great quarries and mines were developed in Snowdonia to meet the roofing needs during the Industrial Revolution; stone quarrying also important with evidence of prehistoric workings at Penmaenmawr	Oakeley family Pennant family Bethesda Blaenau Ffestiniog Llechwedd Slate Caverns National Slate Museum Penrhyn Penrhyn Castle

Name of people	*Processes / products*	*Associated people / processes / places*
Oakeley family	Bought Blaenau slate mines and made them biggest in world	Blaenau Ffestiniog Slate mining and quarrying
Pennant, Richard, [W, ?1737-1808]	Landowner, Jamaica, employer of slaves, established Penrhyn slate quarries as greatest in world and Bethesda village	Bethesda Penrhyn Castle Slate mining and quarrying
Pennant family	One of richest industrial families with intransigent views; Penrhyn Lockouts	Penrhyn Lockouts
People – Coal, anthracite mining etc		
Prehistoric people onward	Wales has UK's largest continuous coalfield, 113km from Pontypool to St Bride's Bay. Coal mined from prehistoric times, demand rose to insatiable levels during Industrial Revolution for steam power (land and sea) heating and exporting. Led to great riches, much injury and illness and many disasters	Afan Argoed Museum Aberdare Museum Cefn Coed Museum Creswell Quay Grove Colliery Hirwaun Llwynypia Colliery Rhondda Heritage Park Saundersfoot National Coal Museum Tower Colliery Pembrokeshire coalfield Memorials
Bute family	Landowners and investors in coal, iron, canals, railways, docks. First marquess moved to Cardiff, second marquess commissioned docks in Cardiff, landlord of Dowlais iron works, started search for coal in the Rhondda, developed Butetown in Cardiff, third marquess became richest man in world. Rebuilt Cardiff Castle and Castell Coch, repaired Caerphilly Castle	Coal mining Commerce Glamorgan Canal Transportation Cardiff Docks Cardiff Castle Caerphilly Castle Castell Coch Benefactors
Coffin, Walter, [W, 1784-1867]	First to exploit coal fields in the Rhondda; *Coffin's Coal* gained excellent reputation	Rhondda
Davies, David [W, 1818-1890]	Masterminded creation of Barry docks and railways, Talerddig cutting deepest in world at time, 1861, Methodist, large donations to University of Wales; statue at Llandinam; granddaughters donated art collection to National Museum	Barry Docks Llandinam
Hood, Archibald [S, 1823-1902]	Scottish engineer and owner of collieries in Gilfach Goch and Llwynypia - latter known for quality of the coke from the site - the best in world. Hood also promoted Barry Railway Company	Llwynypia Colliery Tonypandy Riots Hood Statue, Llwynypia
Lewis Family	Coal pioneers in the Rhondda, including Lewis Merthyr site, now Rhondda Heritage Park, William Thomas Lewis, (later Lord Merthyr, one of the most powerful men in Wales) grandson of Lucy Thomas (see below)	Rhondda Heritage Park Lucy Thomas
Mackworth, Humphrey [E,1657-1727]	Operated coal mining and copper and lead smelting in Neath; also owned lead mines in Cardiganshire; a founder of SPCK in 1698	Lead mining Copper smelting
O'Sullivan, Tyrone [W, 1945-]	Played major role in Miners' Strike; Led workers' buy-out of Tower Colliery in 1994	Miners' strike Tower Colliery
Powell, Thomas [W, 0000-0000]	Founded what became Powell Duffryn Coal Company (nicknamed *Poverty and Death*) – noted for steam coal; built mansion at heart of present Celtic Manor resort	Aberdare, Rhymney Valley
Thomas, David [W, 1794-1882]	At Ynyscedwyn Works, Ystradgynlais, in 1837, first to cast iron using anthracite; revolutionised industry, father of US anthracite coal industry in Pennsylvania	Exporting Iron smelting

Name of people	*Processes / products*	*Associated people / processes / places*
Thomas, Lucy	Female pioneer of steam coal trade, took over husband's business, grandmother of W T Lewis	Lewis family Coal Exchange, Cardiff
People – Gold mining		
Romans onwards	Earliest recorded mining of gold at Dolaucothi; other mines in Dolgellau area currently closed	Dolaucothi Gold Mine Dolgellau
People – Silver mining		
Prehistoric people onwards	Earliest use of metal from c 2500BC; silver mined commercially from late medieval times in small quantities, associated with lead mining	Llywernog Silver-Lead Mine
Middelton, Sir Hugh [W 1560-1631]	Goldsmith/Royal Jeweller, mine owner, banker and engineer; developed clean water supply for London – statue in Islington	Cardiganshire Lead Mining
People – Lead mining		
Prehistoric people onwards	Earliest use of metal from c 2500BC, lead mined commercially from late medieval times; associated with silver mining	Llangynog Llywernog Silver-Lead Mine Minera Lead Mines
Mackworth, Humphrey [E,1657-1727]	Operated lead mines in Cardiganshire; a founder of SPCK	Cardiganshire
Middelton, Sir Hugh [W 1560-1631]	Goldsmith /royal jeweller, mine owner, banker, engineer; developed clean water supply for London – statue in Islington	Cardiganshire Silver mining
People – Copper mining		
Prehistoric people onwards	Earliest use of metal from c 2500BC, copper mined commercially from late medieval times; developed into major industry allied to smelting	Great Orme, Llandudno Parys Mountain Ystwyth Valley
Roe, Charles [E, 1715-1781]	In 1764, obtained lease for Parys Mountain in Anglesey. *The Great Lode* discovered in 1768 turned mine into the largest copper mine in Europe	Parys Mountain
Williams, Thomas [W, 1737-1802]	Dominant in C19 copper industry; ran Parys Mountain mines, created copper smelters; started copper works at Flint and Penclawdd; monopolist, helped make Swansea *Copperopolis*	Parys Mountain Swansea
People – Tinplate manufacture		
Principally from C18 onwards	Development of tinplating became major industry, allied to steel manufacture; Swansea / Neath / Llanelli / Pontypool main areas; Trostre Works still highly productive	Kidwelly Industrial Museum Pontypool House
Allgood Family	Produced Japanware from Usk and Pontypool; it graced tables of Catherine the Great, Louis XIV etc	Pontypool Museum National Museum Wales
Jacob Chivers [E 1817-?]	Introduced steam powered machinery at Wales' second oldest tinplate works at Kidwelly in the 1860's	Kidwelly Industrial Museum
Francis Crawshay [W,1811-1878]	Eccentric manager of Treforest tinplate works and Hirwaun ironworks – commissioned worker portraits – best visual references of ordinary workers	Cyfarthfa Art Collection
Crawshay, William II [W, 1788-1827]	Established tinplate works at Treforest; refused to accept truck system	Cyfarthfa Castle Merthyr Tydfil
Hanbury, John II [W, 1664-1734]	Ironmaster at Pontypool, regarded as founder of tinplate manufacturing; home is now museum	American Gardens, Pontypool Park Trevethin
Charles Gwynn [W ?-?]	Built the second oldest recorded tinplate works in the UK at Kidwelly in 1737	Transport Kidwelly Industrial Museum
Siemens, Wilhelm [G, 1823-1883]	Multi-discipline inventor and innovator; revolutionary open-hearth regenerative furnace for steelmaking tested at Landore also led to much-improved tinplating	Swansea
Thomas, Richard [E, 1837-1916]	Steel and tinplate manufacturer, established works in Neath in 1863; company became Richard Thomas and Baldwins	Neath
Thomas, Richard [E, 1837-1916]	Tinplate manufacturer, established works in Neath in 1863; Richard Thomas & Co became Richard Thomas and Baldwins	Steel manufacture Neath

Name of people	*Processes / products*	*Associated people / processes / places*
People – Copper, nickel, zinc smelting		
Principally from C18 onwards	Copper smelting, with nickel, zinc and other metals, became highly productive during the Industrial Revolution with a huge industrial, and domestic, demand for products. Swansea became *Copperopolis;* Royal Mint opened in new premises at Llantrisant in 1968 to make UK coinage. Copper works were established at Redbrook by 1691; industry failed when major works were built at Swansea; later produces highest quality tinplate	Hafod / Morfa Llantrisant Swansea Swansea Community Boat Wye Valley
Alfred Mond [G, 1868-1930]	Founded Mond Nickel company at Clydach in 1900, largest in world, became division of ICI	Chemicals
Mackworth, Humphrey [E,1657-1727]	Operated coal mining, copper and lead smelting in Neath; also owned lead mines in Cardiganshire; a founder of SPCK	Lead mining Coal mining
Robert Morris [E B?-1768]	Shropshire industrialist with expertise in copper smelting, took control of Llangyfelach works in 1726 –first Swansea copper works, and expanded company's holdings and influence. Family founded industrial township of Morriston.	Landore Swansea
Vivian, John Henry [W, 1785-1855]	Established smelting copper with coal, built Hafod Copper Works; son, Henry Hussey Vivian [1821-1894] greatly expanded business	Glynn Vivian Art Gallery Swansea Museum Swansea Community Boat
Williams, Thomas [W, 1737-1802]	Dominant in copper industry in C19; administered Parys Mountain mines and owned smelters	Parys Mountain Swansea
People – Iron smelting / wire drawing		
Prehistoric people onwards	Abraham Darby's improved method of iron smelting was, arguably, the starting point of the Industrial Revolution and his method was used in Wales at Blaenavon first and latterly many sites. Iron smelting became, with coal production, Wales' greatest industry and in C19 turned largely to steel manufacturing Carding combs used in woollen manufacture needed wire which led to the establishment of Tintern and Whitebrook wireworks at Tintern.	Angidy Furnace Bedwellty House Blaenavon WHS Bersham Ironworks Blaenavon Ironworks Cefn Cribwr Ironworks Cyfarthfa Ironworks Cyfarthfa Castle Dowlais Ironworks The Works, Ebbw Vale Gadlys Ironworks Hirwaun Ironworks Kilgetty Ironworks Neath Abbey Ironworks Penydarren Ironworks Plymouth Ironworks Raby's Furnace, Llanelli Rhymney Ironworks Sirhowy Ironworks Kilgetty Ironworks Tintern Valley Swansea Whitebrook Wye Valley Ynyscedwyn Ironworks
Bacon, Anthony [E, 1718-1786]	Merchant and industrialist; in 1765, leased land in Merthyr Valley, built Cyfarthfa Forge, took over Plymouth Ironworks in 1766 and leased Hirwaun Ironworks in 1789; adapted Wilkinson's patent for boring cannon for Navy	Cyfarthfa
Bailey, Crawshay [E, 1789-1872]	With brother, ran Nantyglo Ironworks, later leased Beaufort Works; opposed regulation of industry; promoter of railways, invested in coal, accumulated land, became MP	Anthony Bacon Joseph Bailey Richard Crawshay Nantyglo Round Towers

Name of people	*Processes / products*	*Associated people / processes / places*
Bailey, Joseph [E, 1783-1858]	With brother, ran Nantyglo Ironworks and later leased Beaufort Works; opposed any regulation of industry; promoter of railways, , accumulated land, became MP	Anthony Bacon Crawshay Bailey Richard Crawshay Nantyglo Round Towers
Bute Family, C18 – C20	Landowners and investors in coal, iron, canals, railways, docks. First marquess moved to Cardiff, second marquess commissioned docks in Cardiff, landlord of Dowlais iron works, started search for coal in the Rhondda, developed Butetown in Cardiff, third marquess became richest man in world. Rebuilt Cardiff Castle and Castell Coch, repaired Caerphilly Castle	Benefactors Coal mining Commerce Transportation Butetown Cardiff Castle Castell Coch Caerphilly Castle
Crawshay, Richard [E, 1739-1810]	Bought Bacon's Cyfarthfa works 1794, at one time largest in world, ran Nantyglo and Beaufort works, 1820-1833, promoted railways, canals and coal	Anthony Bacon Joseph Bailey William Crawshay Cyfarthfa Castle Merthyr Tydfil
Darby, Abraham [E, 1678-1717]	Possibly 'father' of Industrial Revolution; pioneered method of smelting iron using coke, taken up by John Wilkinson ; became major shareholder in Ebbw Vale ironworks	John Wilkinson Ebbw Vale
Guest, John [E, 1722-1785]	Collaborated with Isaac Wilkinson in starting Plymouth Ironworks in 1763; Bought Dowlais iron works; adopted puddling process converting cast to wrought iron	Dowlais
Guest, Josiah J [W, 1785-1852]	Managed Dowlais iron works to largest in world in 1840s employing 7,000 workers; instigated Taff Vale Railway (with I K Brunel), benefactor	Charlotte Guest Merthyr Tydfil
Hill, Thomas [E, 0000-0000]	Established Blaenavon Ironworks with partners in 1789, and built rudimentary tram road, world's first multi-furnace coke-fuelled ironwork; established St Peter's School	Benefactors Samuel Hopkins Blaenavon
Homfray, Samuel [?W, 1752-1822]	Took over family ironworks at Penydarren and was involved with Trevithick's first ever steam powered engine running from Abercynon; also ran ironworks in Tredegar	Richard Trevithick Bedwellty House Tredegar planned town
Tanner, David [W, 0000-0000]	Ironmaster and cannon makers, supplied British troops during American War of Independence; dispute over quality led to bankruptcy about 1795	Angidy Ironworks
Thomas, David [W, 1794-1882]	At Ynyscedwyn Works, Ystradgynlais, in 1837, first to cast iron using anthracite; revolutionised industry, father of US anthracite coal industry in Pennsylvania	Coal, anthracite mining Exporting
Wilkinson, John [E, 1728-1808]	Pioneering ironfounder, perfected method of boring cannon and the cylinders used in Boulton and Watt engines	Bersham Matthew Boulton Bersham Iron smelting James Watt
People – Steel manufacture		
From C19 onwards	The invention of steel manufacturing was another turning point in the Industrial Revolution and in Wales; it became a huge industry, fuelled by local coal; Ebbw Vale (now closed) steelworks was largest in world at time; huge works also at Llanwern, Port Talbot (largest in world in 1952) and Shotton (much reduced in size)	The Works, Ebbw Vale Llanwern Port Talbot Shotton
Henry Bessemer [E, 1813-1898]	Invented 'converter' for steel making 1855 which involved using oxygen in air, blown through molten pig iron, to burn impurities	Dowlais steelworks

Name of people	*Processes / products*	*Associated people / processes / places*
Percy Gilchrist [E, 1851-1935]	Chemist and metallurgist, best known for his collaboration with his cousin, Sidney Gilchrist Thomas on producing low-phosphorus steel from high-phosphorus ores; this meant that steel became cheaply available	Blaenavon
Siemens, Wilhelm [G, 1823-1883]	Multi-discipline inventor and innovator; revolutionary open-hearth regenerative furnace for steelmaking tested at Landore	Landore Tinplating
Thomas, Sidney Gilchrist [W, 1850-1885]	With his cousin, discovered how to make steel using ores containing phosphorus which was then eliminated; slag was used as phosphate fertiliser	Blaenavon
Thomas, Richard [E, 1837-1916]	Steel and tinplate manufacturer, established works in Neath in 1863; Richard Thomas & Co became Richard Thomas and Baldwins	Tinplate manufacture Neath
People – Power generation		
Prehistoric people onwards	Water was vital first source of power, followed by steam, gas, electricity, oil and now renewable sources; Wales has only inland nuclear power station in the UK; Dinorwig fastest on-line pump-storage hydro-eclectic power station in UK; Centre for Alternative Technology a unique attraction and source of advice and expertise	Aberdulais Dinorwig Dyfi Furnace CAT Machynlleth Milford Haven Trawsfynydd Wylva
Grove, William R [W, 1811-1896]	Inventor of two-fluid electric battery and the fuel cell which produces electric current from O and H acting on platinum electrodes; also showed that steam could be disassociated into oxygen and hydrogen	
William Murdoch [S, 1754-1839]	Engineer and inventor, worked for Boulton and Watt, invented gas lighting; early use in Mold and Newtown	Mold Newtown
Newcomen, Thomas [E, 1664-1729]	Invented first practical steam engine, used to pump water from mines including lead mines in Flintshire; engine largely unchanged until James Watt improved it	James Watt
Stephens, Adrian [E, 1795-1876]	Invented steam whistle in 1833 while working at Dowlais Ironworks; early example in Cyfarthfa Castle	Cyfarthfa Castle
James Watt [S, 1736-1819]	Inventor and entrepreneur, devised crucial improvements to Newcomen's steam engine and developed business with Matthew Boulton; aided by John Wilkinson; harnessed water at Angidy for 20 waterwheels , installed in 1820	Matthew Boulton John Wilkinson
People – Transportation		
Principally C18 onwards	The Industrial Revolution would not have succeeded without the parallel developments in transportation; tram roads and canals played a major role initially with improved roads and then railways succeeding them; ports grew to world-scale; improved bridge and tunnel technology allowed railways and roads to develop further; narrow gauge railways played major role; all the great names of the era were involved from Trevithick, Newcomen and Watt to Telford, Stephenson and Brunel (commemorated at Neyland) Many famous bridges including Transporter Bridge, Newport, based on French design, opened 1906, one of seven left in world (cf Middlesbrough); Robert Stephenson's Britannia Bridge over Menai Strait; Brunel's Menai Bridge, Chepstow Bridge and Landore Viaduct; George St Bridge, Newport, earliest cable-stayed bridge in UK; first Severn Bridge was most advanced engineering project of its kind in 1966 (all in England); etc	Britannia Bridge Cardiff Docks Chepstow Bridge Conwy Tunnel Crumlin Viaduct Llanelli Docks Menai Bridge Narrow gauge railways Newport Docks Neyland Pontcysyllte Viaduct WHS Pontypridd Bridge Newport Transporter Bridge River Wye Severn Bridges Severn Tunnel Swansea Docks Thomas Telford Centre

Name of people	*Processes / products*	*Associated people / processes / places*
Isambard Kingdom Brunel [E, 1806-1859]	Railway engineer responsible for Taff Vale Railway, Vale of Neath Railway, South Wales Railway (with terminus at Neyland), Chepstow Bridge, Landore Viaduct	Josiah Guest Neyland
Davies, David [W, 1818-1890]	Founded Parc and Maerdy collieries and masterminded creation of Barry docks; built railways in Mid-Wales across Tregaron bog etc; Talerddig cutting deepest in world at time	Barry Docks Benefactors
Griffiths, William [W,1756-1826]	Built first transport links into Rhondda; created tramroad from Hafod to Newbridge (Pontypridd); built canal to link with Glamorganshire Canal	Rhondda
Homfray, Samuel [?W, 1752-1822]	Owned ironworks at Penydarren; involved with Trevithick's first ever steam powered engine running from Abercynon	Richard Trevithick Bedwellty House
Mackworth, Humphrey [E,1657-1727]	Operated early copper works and commissioned a canal from his copper works to the Nedd – the first in 'industrial' Wales	Coal mining Lead mining Copper smelting Melyncryddan Canal
Thomas Kymer [W, B? - 1784]	Built Wales' first canal in 1766/1768. He constructed the three-mile long canal and dock to transport coal from his coalpits near Carway to a shipping place near Kidwelly	Coal mining Gwendraeth Valley Kidwelly
Telford, Thomas [S, 1757-1834]	Civil engineer, architect and stonemason, and a noted road, bridge and canal builder; achievements in Wales include Pontcysyllte aqueduct on Llangollen Canal and Menai Bridge	Menai Bridge Pontcysyllte Canals
Trevithick, Richard [E, 1771-1833]	Inventor and mining engineer; his was first train in world hauled by steam locomotive on Penydarren tramroad in 1804	Samuel Homfray
People – Commerce		
Principally C18 onwards	Wales's commercial sector grew alongside industry to service its needs and to benefit from its success. Banking and other financial services grew quickly and trading was a major activity particularly in relation to exporting. Supply industries prospered – everything from papermaking to pottery, woollen manufacturing to food production. The major cities grew as administrative and commercial activities matched those of industry. World's first £1 million deal struck at Coal Exchange	Coal Exchange, Cardiff Cardiff Newport Swansea
Bute family	Landowners and investors in coal, iron, canals, railways, docks. First marquess moved to Cardiff, second marquess commissioned docks in Cardiff, landlord of Dowlais iron works, started search for coal in the Rhondda, developed Butetown in Cardiff, third marquess became richest man in world. Rebuilt Cardiff Castle and Castell Coch, repaired Caerphilly Castle	Benefactors Commerce Butetown Cardiff Castle Castell Coch Caerphilly Castle Coal Exchange, Cardiff
Pryce-Jones, Sir Pryce [W, 1834-1920]	Draper selling woollen products, started mail order business in Newtown, expanded into global concern with 100,000 customers	Newtown
Hughes, John [W, 1814-1899]	Marine, armaments etc engineer and entrepreneur; patented inventions and made fortune; invited by Tsar to help develop Russia's railways; established largest steelworks in Russia (at the time) in Ukraine at Hughessovka (Yuzovka)	Exporting
Richard Thomas	First continuous strip mill in UK in Ebbw Vale	Ebbw Vale Steel making

Name of people	*Processes / products*	*Associated people / processes / places*
People – Exporting		
Principally C18 onwards	Wales' Industrial Revolution was partly fuelled by the demands of markets in other parts of the UK and, even more so, abroad; docks grew at great rates and handled huge volumes of coal, iron, steel and other products as raw materials or manufactured goods; Wales's other export was people, but as experts and entrepreneurs and as emigrants seeking the fortune elsewhere	John Hughes David Thomas Amlwch Barmouth Barry Docks Cardiff Docks Llanelli Docks Newport Docks Pierhead Building, Cardiff Porthmadog Saundersfoot Harbour Swansea Docks
Bute family	See above	
Pryce Pryce-Jones,	See above	
Sir William Reardon Smith [E, 1856-1935]	Devon ship's master before going into the shipping business; In 1905, he founded his own company, William Reardon Smith & Sons Ltd, based in Cardiff, where he had made his home. The company owned the St Just Steamship Company, Leeds Shipping Company and Cornborough Shipping Line. By his death the company owned twenty-eight ships. Reardon Smith was also a major benefactor to the National Museum Wales	Cardiff
People – Reclamation		
Mid C20 onwards	When the major extractive and primary industries retrenched and, in many cases, closed, the landscape of much of south east Wales was left in a decayed and damaged state; since the 1970s, much reclamation work has taken place including in areas where there were major disasters; along with reclamation came regeneration with new industries and commercial activities using sites once covered by coal mining, steel making and other industries; one new town was built at Cwmbran	Aberfan Blaenavon Brymbo Cardiff Docks Ebbw Vale Llanelli Merthyr Tydfil Rhondda Shotton Swansea Docks

Wales – The first industrial nation: Social reformers / activities / places		
Name of people	***Activities***	***Associated people / activities / places***
Benefactors		
Bute Family	Gave Cardiff Castle to the city, Castell Coch to Wales and refurbished Caerphilly Castle	Coal mining Commerce Transportation Butetown Cardiff Castle Castell Coch Caerphilly Castle
Crawshay, Francis [E/W, 1811-1878]	Interested in workers, provided money for families of cholera victims, removed truck system, established two schools, Welsh speaker, commissioned portraits of workers	Richard Crawshay, Richard Thompson Crawshay, Cyfarthfa Ironworks
Crawshay, Rose Mary [E/W, 1828-1907]	Promoted philanthropic, educational and women's causes; set up soup kitchen to avoid waste at Cyfarthfa Castle	Richard Crawshay Richard Thompson Crawshay Cyfarthfa Castle
Davies, David [W, 1818-1890]	Masterminded creation of Barry docks and railways, Talerddig cutting deepest in world at time, 1861, Methodist, large donations to University of Wales	Barry Docks
Davies, Gwendoline [W, 1882-1951] and Margaret [W, 1884-1963]	Grand-daughters of David Davies Created collection of French paintings, later donated to National Museum Wales	National Museum Wales
Guest, Charlotte [E, 1812-1895]	Wife of Josiah, benefactor, translator of Mabinogion and Tale of Taliesin, learnt Welsh, established schools and new teaching methods, patron of Penry Williams	Josiah Guest Dowlais Ironworks
Guest, Josiah J [W, 1785-1852]	Paternalistic, funded schools, workmen's libraries, church etc with wife, Charlotte	Charlotte Guest Dowlais Ironworks Iron smelting
Hill, Thomas [E, 0000-0000]	Iron founder at Blaenavon; built St Peter's School, 1816	Blaenavon Iron Works St Peter's School, Blaenavon
Homfray, Samuel [?W, 1752-1822]	Took over family ironworks at Penydarren and was involved with Trevithick's first ever steam powered engine running from Abercynon; also built planned town in Tredegar	Richard Trevithick Bedwellty House Tredegar Town
Hopkins, Samuel [E, 0000-0000]	Iron founder at Blaenavon; built St Peter's School	Blaenavon Iron Works St Peter's School, Blaenavon
Sir William Reardon Smith	Shipowner and major benefactor to the National Museum Wales	Cardiff National Museum Wales
Vivian Family	In C19, built community for their copper workers – Trevivian, now Hafod, good homes, also school and church; Richard Glynn Vivian established art gallery in Swansea	Coppersmelting Hafod (Copperopolis)
Chartists		
Frost, John [1784-1877]	Draper, ex-mayor of Newport, Leader of Newport Rising 1839, sentenced to transportation	Newport Rising
Jones, William [W, 1809-1873]	Watchmaker, publican and Chartist, led eastern valleys marchers in Newport Rising	Newport Rising
Philips, Thomas [W, 1801-1867]	Mayor of Newport at time of Newport Rising, knighted for part in repelling Chartists	Newport Rising
Prothero, Thomas [W, 1780-1853]	Solicitor and town clerk of Newport, strongly anti-Chartist after personal arguments with John Frost	

Name of people	*Activities*	*Associated people / activities / places*
Price, Dr William [W, 1800-1893]	Surgeon / physician, arch-druid (helped reintroduce Eisteddfod), promoted legalised cremation and Cooperative Movement, prolific father; Chartist leader in 1839	Cooperative Movement
Shell, George [W, 1821-1839]	Pontypool carpenter, Chartist, killed in Newport Rising, had written letter to mother in case of his demise	Newport Rising
Vincent, Henry [E, 1813-1878]	Active in forming first working men's associations in Britain, Chartist leader; in 1838 given responsibility for promoting universal suffrage and welfare benefits in South Wales; arrested and imprisoned in Monmouth; led to Newport Rising	Newport Rising
Williams, Zephaniah [W, 1795-1873]	Publican, collier at Blaina, and reformer, led Blaenau Gwent Chartists to Newport	Newport Rising Newtown
Cooperative Movement		
Owen, Robert [W, 1771-1858]	Innovator, entrepreneur, social reformer, trade unionist	Cooperative movement Trade unions
Price, Dr William [W, 1800-1893]	Surgeon / physician, arch-druid (helped reintroduce Eisteddfod), proponent of legalised cremation and Cooperative Movement, prolific father; Chartist leader in 1839	Chartists
Education		
Jones, Griffith [W, 1683-1761]	Anglican priest, early supporter of SPCK, set up circulating schools in 1731 to teach children through Welsh language	Llanddowror
Board Schools	Government-funded schools set up in all communities where there was inadequate provision of elementary education, provided English-based teaching for all young people	
Working men's institutes	Major influence in mining communities largely paid for by working men themselves but often with contributions from employers; noted examples remain	Blackwood Blaenavon Newbridge Parc and Dare Rhosllanerchrugog
Non-conformists	Quakers, Methodists, Congregationalists, Unitarians etc – major influence on education, social and cultural life	
Society for the Propagation of Christian Knowledge	SPCK founded in 1698 SPCK with aim of helping people to understand and to grow in the Christian faith	Humphrey Mackworth
Sunday schools	Played a major part in education of young people although largely confined to developing Christian faith	
Name of people	*Activities*	*Associated people / activities / places*
Workers' Educational Association	WEA, UK's largest voluntary provider of adult education, founded in 1903 to support the educational needs of working men and women; played a strong role in South Wales communities	
Works schools	Schools provided by companies for education of children of workers	
Export of people		
From at least early medieval period	Perhaps Wales's most valuable export has been its people; from earliest days, people have left what is now Wales to make their mark elsewhere as craftspeople, teachers, soldiers, entrepreneurs, politicians and much more. The world has been their oyster, not least Patagonia, North America and Australasia	Exporting
Hughes, John [W, 1814-1899]	Marine, armaments etc engineer and entrepreneur; patented inventions and made fortune; invited by Tsar to help develop Russia's railways; established largest steelworks in Russia (at the time) in Ukraine at Hughessovka (Yuzovka)	Exporting
Thomas, David [W, 1794-1882]	Father of US anthracite coal industry in Pennsylvania	Iron smelting

Name of people	*Activities*	*Associated people / activities / places*
Politics		
Bevan, Aneurin (Nye) [W 1897-1960]	Former miner, politician, cabinet minister, Marxist, union leader, introduced NHS c 1947 inspired by Tredegar Medical Aid.	Keir Hardie Trade unions Ebbw Vale Tredegar
Foot, Michael [W, 1913-2010]	Labour Party politician, journalist and author, MP from 1945 to 1955 and, for Ebbw Vale, from 1960 until 1992; Leader of the Opposition from 1980 to 1983; associated with the Labour left for most of his career, supporter of CND; passionate orator	Ebbw Vale
Hardie, Keir [S, 1856-1915]	Founder of Independent Labour Party, MP for Merthyr Tydfil and Aberdare 1900, encouraged growth of Labour Party in south Wales coalfield	Aneurin Bevin Ebbw Vale Miners trade unions
Kinnock, (Lord) Neil [W, 1942-]	Labour Party politician, MP for Bedwellty / Islwyn from 1970 until 1995 and as Labour Leader and Leader of the Opposition from 1983 until 1992; served as a European Commissioner from 1995–2004; regarded as one of Labour's elder statesmen	Bedwellty
Labour party	Founded (as ILP) by Keir Hardie, dominated Welsh politics for most of C20	Aneurin Bevin Michael Foot Keir Hardie Neil Kinnock
Trade Unions	Welsh workers played leading part in establishment and direction of the trade union movement from its beginnings in Chartist and other movements	Aneurin Bevin Keir Hardie
Social welfare		
Andrews, Elizabeth (W, 1882-1960)	Labour Party activist, former suffragette, leader in movement to have pit baths installed and nursery schools established	Rhondda
Bevan, Aneurin (Nye) [W 1897-1960]	Former miner, politician, cabinet minister, Marxist, union leader, introduced NHS c 1947 inspired by Tredegar Medical Aid.	Keir Hardie Trade unions Ebbw Vale Tredegar
Caerphilly Miners' Hospital	Built 1923 to serve miners in Rhymney Valley; they paid contributions towards care	Caerphilly
Chapels	Non-conformist places of worship; played very important educational, social and welfare role	Many examples
Davies, David (Dai'r Cantwr) [W, 1812-1874]	Poet, lay preacher, one of ring leaders in Rebecca Riots	Rebecca Riots
Friendly societies	Important element of social history	
Holiday resorts	Late C19 / early C20 destinations for workers, eg Davies homes on Barry Island, Trecco Bay (Porthcawl)	Barry Island
Insurance societies		
Jones, John (Shoni Sguborfawr) [W, 1811-1858]	Bear-knuckle boxer, one of ring leaders in Rebecca Riots	Rebecca Riots
Lloyd George, (Earl) David [W, 1863-1945)	Liberal politician and statesman, 1916–22, leader of Liberal Party from 1926–31; key figure in introduction of many reforms which laid foundations of modern welfare state. He was last Liberal to be Prime Minister, and only British Prime Minister to be Welsh and to speak English as second language	
Quakers	Worthing Quakers' scheme for light industry to give work to miners affected by 1926 General Strike known as Brynmawr Experiment	Brynmawr Museum General Strike
Rebecca Riots	Series of riots led by small farmers against toll roads, ultimately successful;	Sarah Williams

Name of people	*Activities*	*Associated people / activities / places*
Tredegar Medical Aid	Forerunner of NHS, inspired Aneurin Bevan	Aneurin Bevan Tredegar
Williams, Sarah	75-year-old toll gate keeper fatally shot at Hendy Toll House during Rebecca Riots	Rebecca Riots
Workers' housing	Company-built houses provided workers with homes but tied them to their jobs	Bute Town (Rhymney) Butetown Rhydycar Cottages (National History Museum)
Working men's institutes	Major influence in mining communities largely paid for by working men themselves but often with contributions from employers; noted examples remain	Blackwood Blaenavon Parc and Dare Rhosllanerchrugog
Workers' rights		
Abraham, William (Mabon) [W, 1842-1922]	Trade unionist and Labour politician, MP for Rhondda from 1885 to 1920; moderate voice believing that disputes should be solved through dialogue; noted for his powerful voice; renowned orator in English and Welsh	Rhondda
Cook, A J [E, 1883-1931]	Arthur James, known as A J, coal miner and trade union leader; remembered as one of best-known miners' leaders and a key component of the National Minority Movement (NMM) around the General Strike of 1926.	Merthyr Tydfil
Merthyr Rising	1831, ironworkers struck against redundancies, rising prices and bailiffs; several thousand workers involved in riots that led to bloody suppression by troops and mass arrests, Lewis Lewis one or ring leaders	Merthyr Tydfil Richard Lewis
Miners' strikes	Welsh miners always took full part in local and national strikes including the General Strike of 1926 and the last national strike in 1984/5	Brynmawr Experiment Brynmawr Museum
O'Sullivan, Tyrone [W, 1945-]	Played major role in Miners' Strike; Led workers' buy-out of Tower Colliery in 1994	Miners' strike
Penallta Sit-in	Post-nationalisation workers' strike – remained on site	Penallta
Penrhyn Lockouts	One of longest industrial struggles in UK, based on Bethesda and Penrhyn Quarries	
Penderyn, Dic (Richard Lewis) [W, ?1807-1831	Hanged (wrongly) for stabbing Sergeant Black in the Merthyr Rising, 1831	Merthyr Tydfil
'Scotch Cattle'	Scotch Cattle in C19 were bands of coal miners who, in disguise, attacked other miners and homes of miners who were strike-breaking or cooperating with employers against local mining community. Active possibly from 1808 until1850; repeated during General Strike in 1926.	
Tonypandy Riots	Miners locked out of Cambrian Combine pits in the Rhondda due to disputes over pay; considerable unrest	Rhondda
Trade Unions	Welsh workers played leading part in establishment and direction of the trade union movement from its beginnings in Chartist and other movements	Keir Hardie Aneurin Bevin
Memorials		
Aberfan	Recently refurbished memorials to 1966 spoil tip collapse that killed 116 children and 28 adults; land now reclaimed	Aberfan, Merthyr Tydfil Reclamation
Cefn Golau Cholera Cemetery	Graves of victims of outbreaks in 1832/3, 1849 and 1866	Cefn Golau, Tredegar
Gresford	Memorial erected in 1982 to 1934 mining disaster that killed 266 miners	Gresford, Wrexham
Landshipping	Memorial erected in 2002 to 1844 mining disaster that killed 40 men, women and children	Landshipping, Narberth
Senghenydd	Memorial to 439 killed at Universal Colliery in 1913, worst disaster in Welsh mining history	Senghenydd
Six Bells	Memorial called *Guardian* erected in 2010 to 1960 mining disaster that killed 45 men	Aberbeeg, Abertillery

Wales – The first industrial nation: Examples of additional people / processes / activities / places		
People / processes / activities / places	***Processes / products / activities***	***Associated people / processes / activities /places***
Beer	Wrexham Lager Beer Co, established 1881, first lager beer brewer in UK Rhymney Brewery	
Beynon, Granville [W, 1914-1996]ENG	Physicist, studied ionosphere, as president of International Union of Radio Science established world's most advanced radar facility for studying upper atmosphere	
Boddington, Lewis [W, 1907-1994	Developer of angled flight deck of aircraft carriers	
Boulton, Matthew [E, 1728-1809]	Partner of James Watt in development of improved steam engines	James Watt
Canals	Widespread building programme to link coal mines and ports in C17/18 and later canals such as the Llangollen designed by Telford, with its Pontcysyllte aqueduct	Humphrey Mackworth Thomas Telford Pontcysyllte
Chemicals	Royal Ordnance factories,	Alfred Mond Clydach
Coinage	Royal mint established at Llantrisant 1968	Llantrisant
Conwy tunnel	Britain's first immersed tube road tunnel c 1991	
Corona soft drinks	William Thomas and William Evan served temperance movement with fizzy drink in 1897	
Crawshay, Robert Thompson [W, 1817-1879]	Established Cyfarthfa band	Rose Mary Crawshay Merthyr Tydfil
Davies family	Monumental ironsmith at Cross Foel, eg Chirk Castle gates	
Davies, David [W, 1871-1931]	Colliery manager and paleobotanist, pioneer in fossil plant ecology at Gilfach Goch, statue in Llandinam	Bersham
Davies, Donald [W, 1924-1999]	Invented 'packet switching', essential part of modern data transmission	
Davies, Hugh Morriston [W, 1879-1965]	Showed that X-rays could be used in diagnosis of lung tumours	
Davies, John Cecil [W, 1864-1927]	Mill-boy to magnate, mobilised Wales's industrial resources for production of munitions in WW1	
Davies, Thomas Morris [W, 1865-1951] and Walter [W, c1870-c1950]	Patented spare wheels for motor cars – clipped on to damaged wheel	
People / processes / activities / places	***Processes / products activities***	***Associated people / processes / activities /places***
Frost, William [W, 1848-1935]	Carpenter, reputedly the first man to fly in a heavier than air machine, at Saundersfoot in 1896; never authenticated	Horace Watkins
Gilbertson, Francis W [W, 1873-1929]	Third generation tinplate manufacturer at Pontardawe, spokesman for sheet steel industry and first president of UCSwansea, 1920	Tinplating
Gould, William	Merthyr grocer, invented secret automated ballot box 1870	
Horse bus	First horse buses in Swansea , i826, three years before London	
Hughes, Michael [W, 1752-1825]	Copper industrialist, partner in Parys Mountain mine	Parys Mountain
Hydroelectric power	Ffestiniog was UK's first major pumped-storage power station; Dinorwic is Europe's largest; Aberdulais largest generating water wheel in Europe	Blaenau Ffestiniog Dinorwic
Leather tanning, shoe making	Important part of rural economy, many centres, eg Rhayader, closed 1950s, now in St Fagans; Llannerch-y-medd had 250 cobblers in 1880s	St Fagans
Lewis Boys School	Established in Pengam in 1729	

Maddock, Ieuan, (W, 1917-1988]	Scientist, overall charge of first six UK atomic bomb tests	
Morris, George Lockwood [W,1859-1947]	Industrialist, iron founder, Welsh rugby player	
Nash, John [W, 1752-1835]	Distinguished architect, designed great houses, prisons, bridge and rebuilt west front of St David's cathedral, had contacts with Thomas Johnes	Thomas Johnes
Nuclear power	Wylfa and Trawsfynydd power stations, latter ?only inland one in UK	Trawsfynydd Wylfa
Oil refining	Milford Haven major site of oil refining, now decreasing	Milford Haven
Parry, Joseph	Ironworker and composer, wrote *Myfanwy*. *Family home is now a museum*	Workers' housing, Cyfarthfa Ironworks
Pottery	What began in prehistoric times, Welsh pottery became important exporting industry with major potteries at Ewenny, Buckley, Nantgarw, Swansea, Llanelli, Portmeirion	Bridgend Swansea National Museum Wales Portmeirion
Preece, William Henry [W, 1834-1913]	Invented railway signalling system to improve safety, encouraged Marconi, introduced first telephones into Britain	
Railways	Greatly increased prosperity; early tramways, Trevithick steam locomotive at Penydarren; Hill's tramway, Taff Vale Railway, Chester to Holyhead (1849), Brunel's GWR line and Severn Tunnel; Little Trains of Wales in many places, most based on industrial beginnings including Snowdon Mountain railway, only rack and pinion railway in UK	Blaenau Ffestiniog Blaenavon Isambard Kingdom Brunel Josiah Guest Richard Trevithick
Reservoirs etc	Major schemes included Vyrnwy for Liverpool in 1881, Elan Valley for Birmingham in 1893/1904, Llyn Celyn for Liverpool in 1965 (and outcry), Trawsfynydd for Maentwrog and Trawsfynydd power stations;	Hydroelectric power Nuclear power
Roads	A5 designed by Telford, M4, A465 Heads of the Valley etc	Isambard Kingdom Brunel
Severn Tunnel	Severn Tunnel, completed in 1885, was for nearly a century the longest undersea tunnel in the world	
Trubshaw, Brian [W, 1924-2001]	From tinplate family, chief test pilot of Concorde	
Watkins, Horace [W, 1884-1976]	Aviation pioneer, built and claimed to fly Robin Goch monoplane in 1910, would have been first person to achieve heavier-than-air flight in Wales – unless Frost did it in 1896	William Frost
Williams, Evan [W, 1903-1945]	Leading physicist, involved with particle physics, provided proof that fundamental particles can be transformed into other particles; introduced degaussing of ships to protect them against magnetic mines	