

A satellite image of Earth from space, showing the continent of Africa and the surrounding Atlantic Ocean. The image is centered on the African continent, with the blue of the ocean and the white of clouds contrasting with the brown and green of the land. The text is overlaid on the top half of the image.

Mine for ever

Our use of the Earth's resources

David Manning
Professor of Soil Science
Newcastle University

Mine for 45 minutes

- Why do we need mining at all in this day and age?
- Mining and sustainable development
- Quakers and mining
- Our responsibilities for mining
- Mining in the future

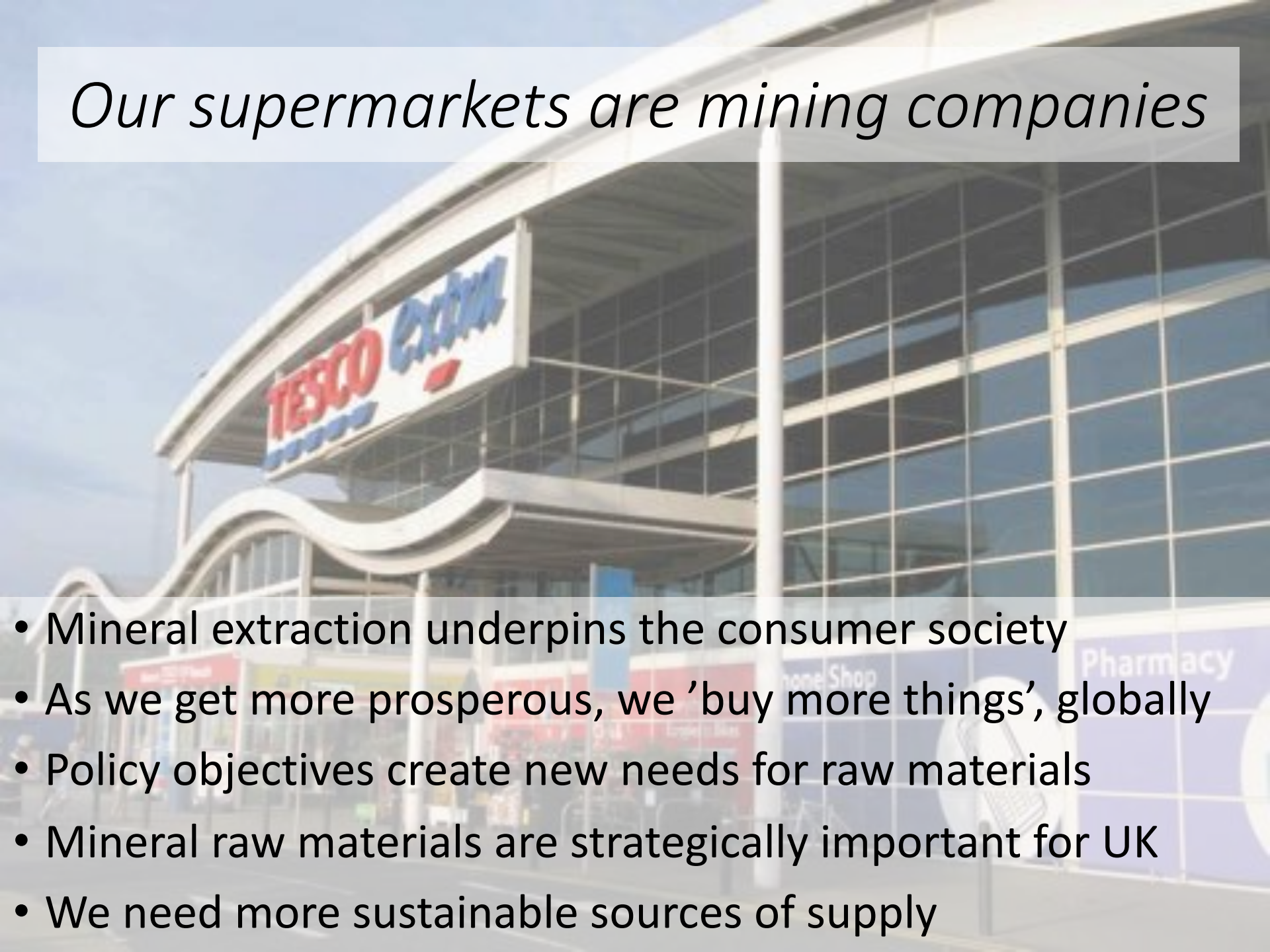


Why do we need to mine?

Because we are all consumers



Our supermarkets are mining companies

- 
- Mineral extraction underpins the consumer society
 - As we get more prosperous, we 'buy more things', globally
 - Policy objectives create new needs for raw materials
 - Mineral raw materials are strategically important for UK
 - We need more sustainable sources of supply

People are moving from this



To this



Instead of driving this



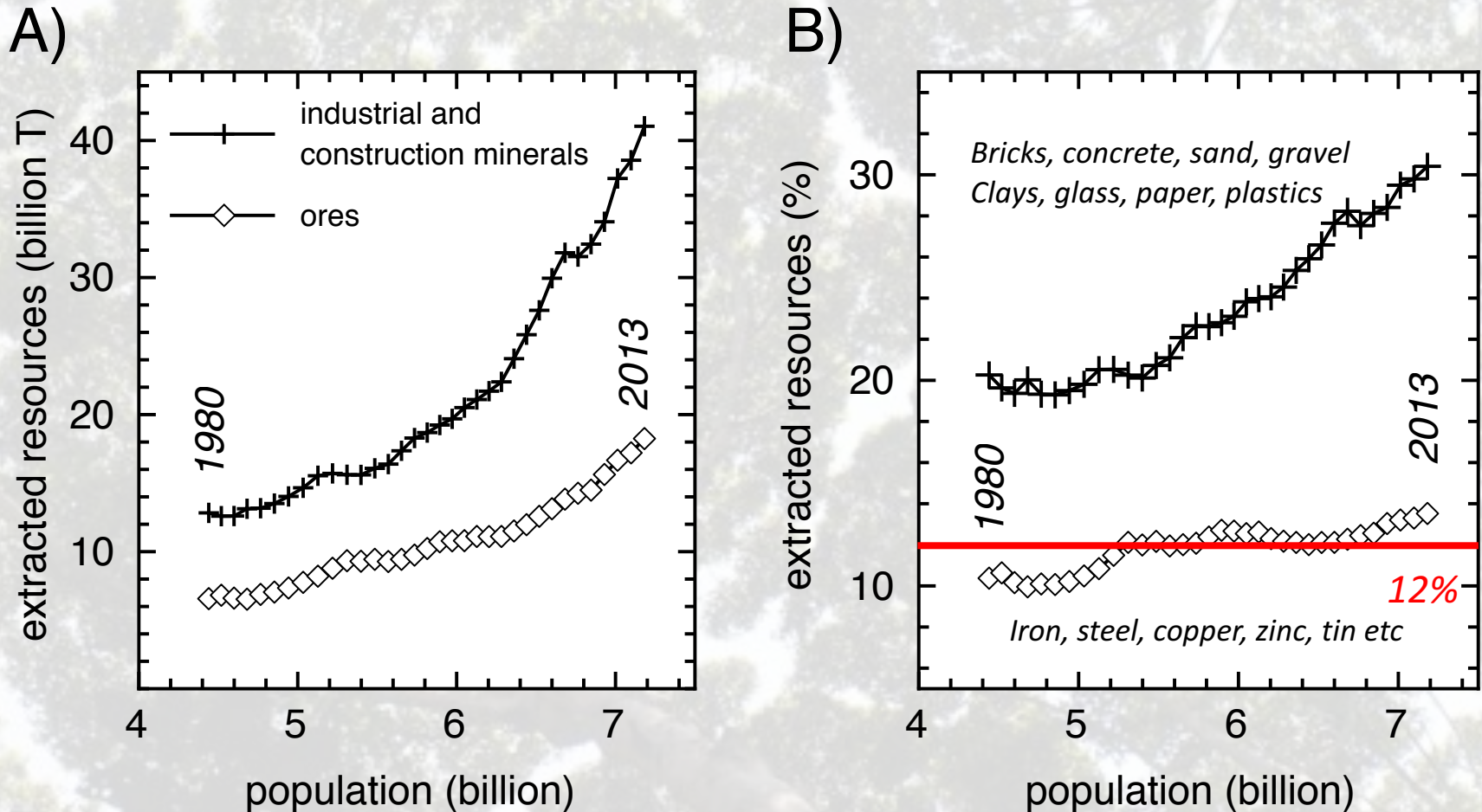
People want to drive this



Somewhere to live
Something to eat/drink
Something to buy
Something to burn



Society's mineral use differs



- Metal ores rising
- Mineral production rising much more rapidly

The Americans love this sort of thing

Every American Born Will Need...



3.188 million pounds of minerals, metals, and fuels in their lifetime



FEBRUARY 2016

The economy simply could not function without minerals. Without them, life as we know it could not be sustained on its current scale. The message from the underlying flowchart is clear: minerals underpin everything in the UK economy.

www.cbi.org.uk/news/minerals-critical-to-the-uk-economy/

The underlying flowchart

2 ESSENTIAL TO THE ECONOMY

www.cbi.org.uk/news/minerals-critical-to-the-uk-economy/

Chart 2: **The flow of minerals through the economy (2013)** (Source: ONS, ABS, MPA)

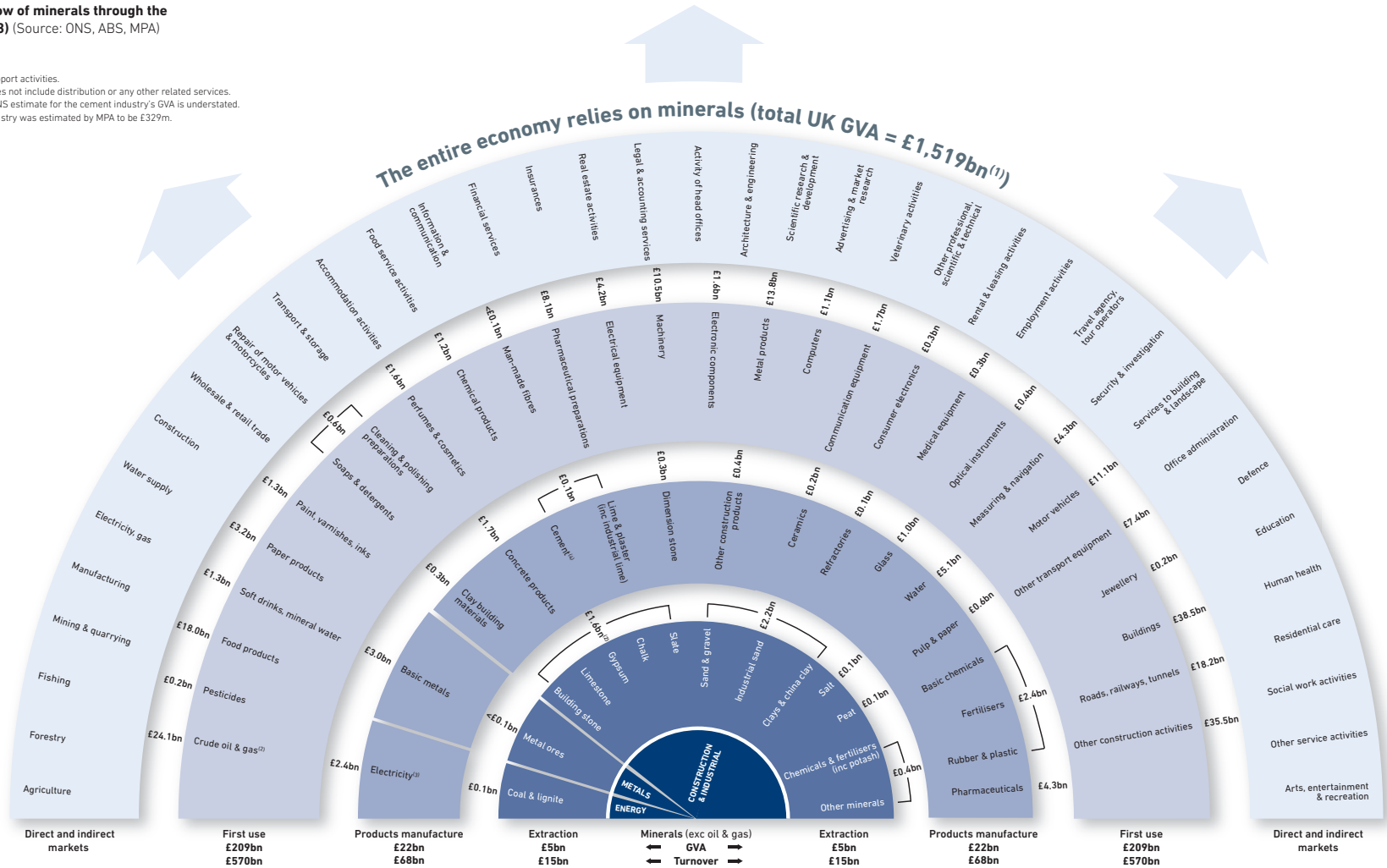
Notes:

⁽¹⁾ Sections A-S.

⁽²⁾ Includes mining support activities.

⁽³⁾ Production only. Does not include distribution or any other related services.

⁽⁴⁾ MPA believes the ONS estimate for the cement industry's GVA is understated. 2013 GVA for this industry was estimated by MPA to be £329m.



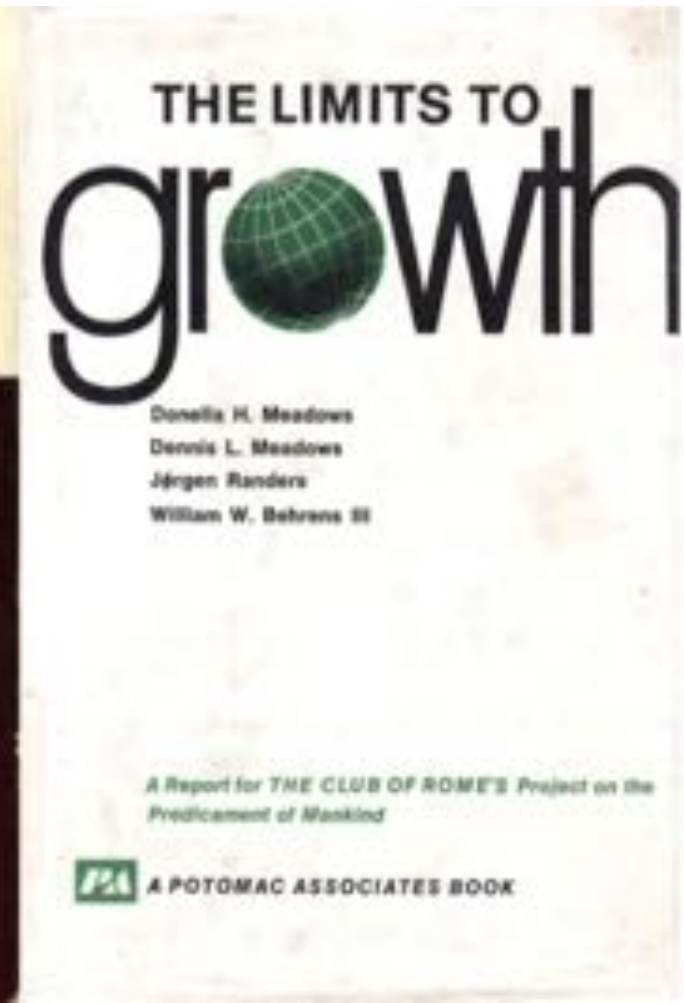
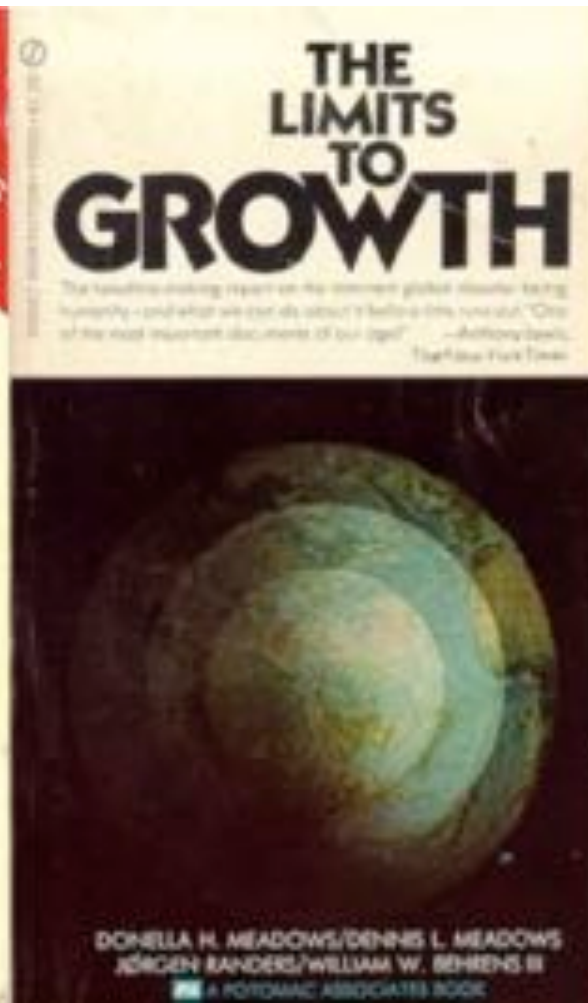
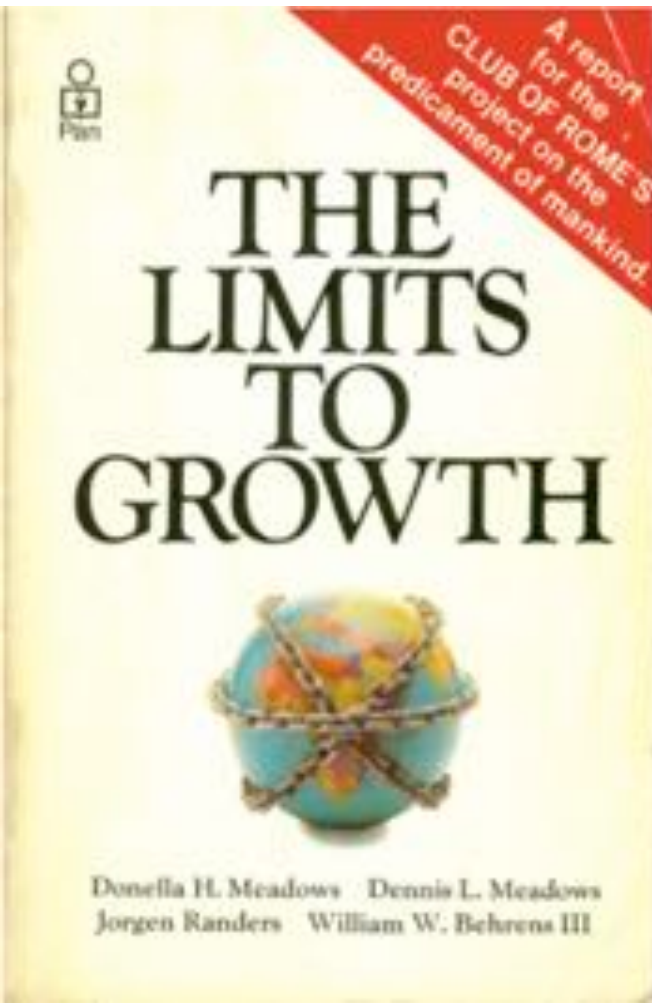
We need minerals more than ever

- As raw materials for industry
- To build houses, roads etc
- As fuels
- As fertilisers

But there are pressures:

- How can we meet the needs of a global population that is growing in number and wealth?
- How can we guarantee security of raw material supply?
- How can we mine sustainably?

The conflict between minerals and sustainability



The conflict between minerals and sustainability

- Sustainability requires us to make sure that our actions do not have harmful consequences for future generations
- On a human time scale, minerals are a non-renewable resource
- So, use of minerals appears to be unsustainable, by definition. We need to be very good at recycling.
- This isn't possible for many manufacturing processes.

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A reminder – what is ‘sustainability’?

Brundtland Report (1987) defines sustainable development as *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”*.

“It contains within it two key concepts:

- The concept of ‘needs’, in particular the essential needs of the world’s poor, to which overriding priority should be given; and*
- The idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs”*

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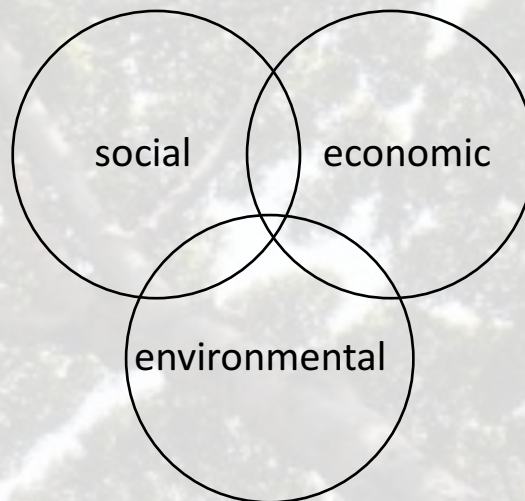
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People cannot survive without mining

- Human life is unsustainable without mining
- Therefore, mining needs to pay attention to sustainability, and to its three pillars: economic, social, environmental
- What is defined as sustainable changes with time



Economic sustainability

- Mining creates jobs
- Mining creates wealth

Remember, capital expenditure can be very high

- Those who start a mine take a financial risk
- Mining cannot happen without people being prepared to take a financial risk

Social sustainability

- Mining takes place with the consent of the people
- Regulation governs permission to mine
- Regulation protects the interests of the community
- Regulation protects the environment

Environmental sustainability

- Mining has a history of damaging the environment, sometimes on a large scale
- Many efforts have been made in the late 20th and the 21st centuries to correct past damage and to prevent future damage
- Much more needs to be done
- Future generations may have different standards and technologies

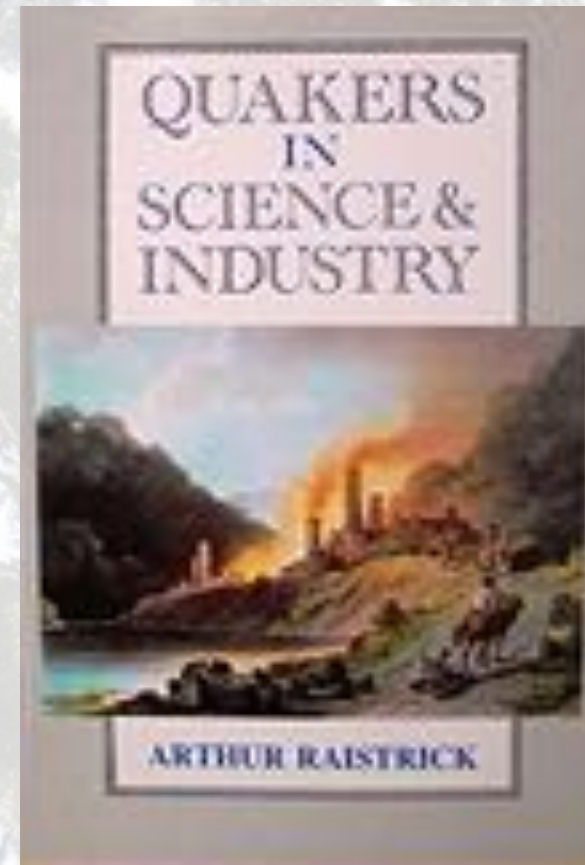
Quakers and mining

- As dissenters, Quakers could not hold public office – so many went into business



Quakers and mining

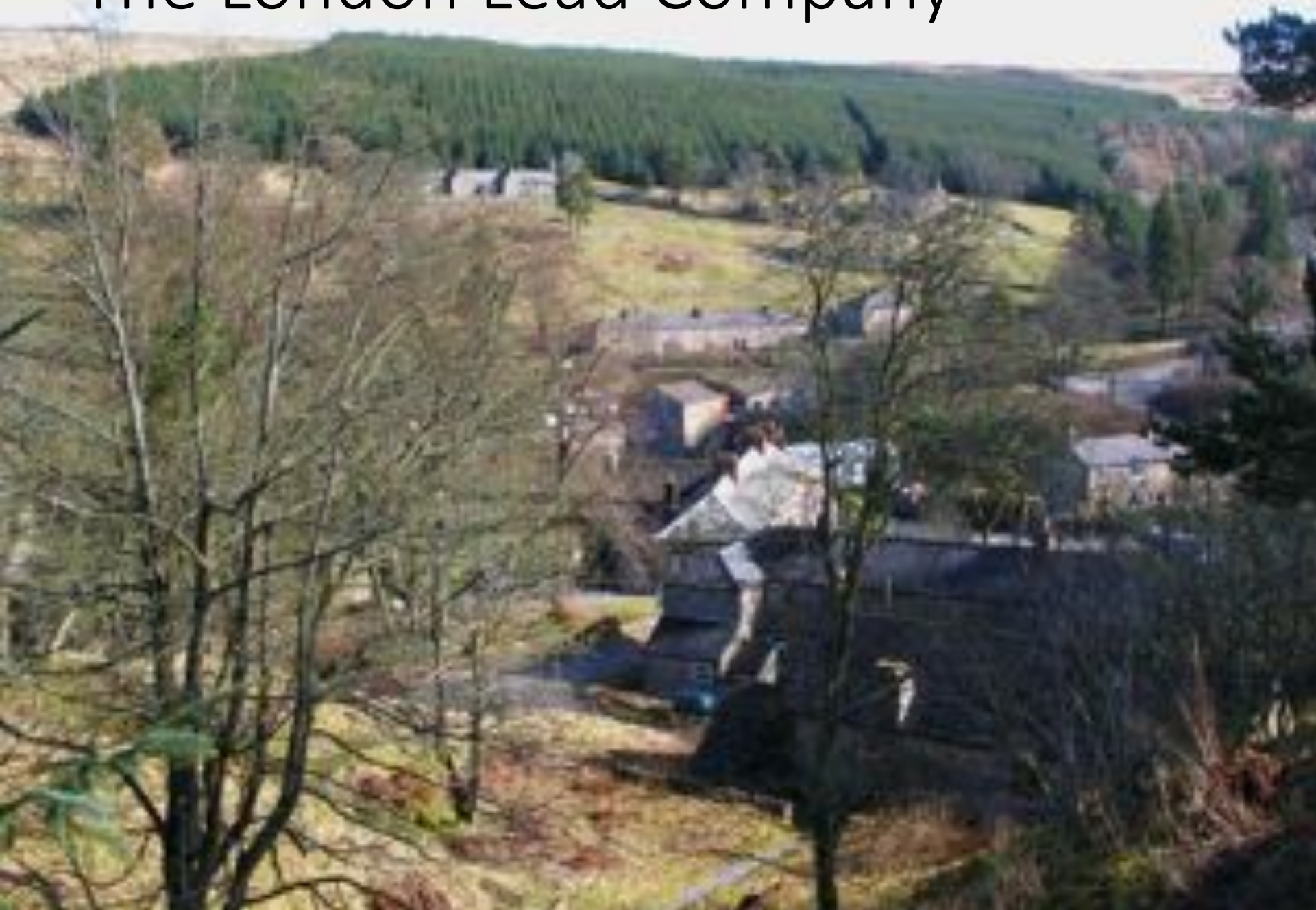
- As dissenters, Quakers could not hold public office – so many went into business
 - Chocolate
 - Biscuits
 - Banking
 - Iron and Steel
 - Mining
 - Pottery



Quaker mining

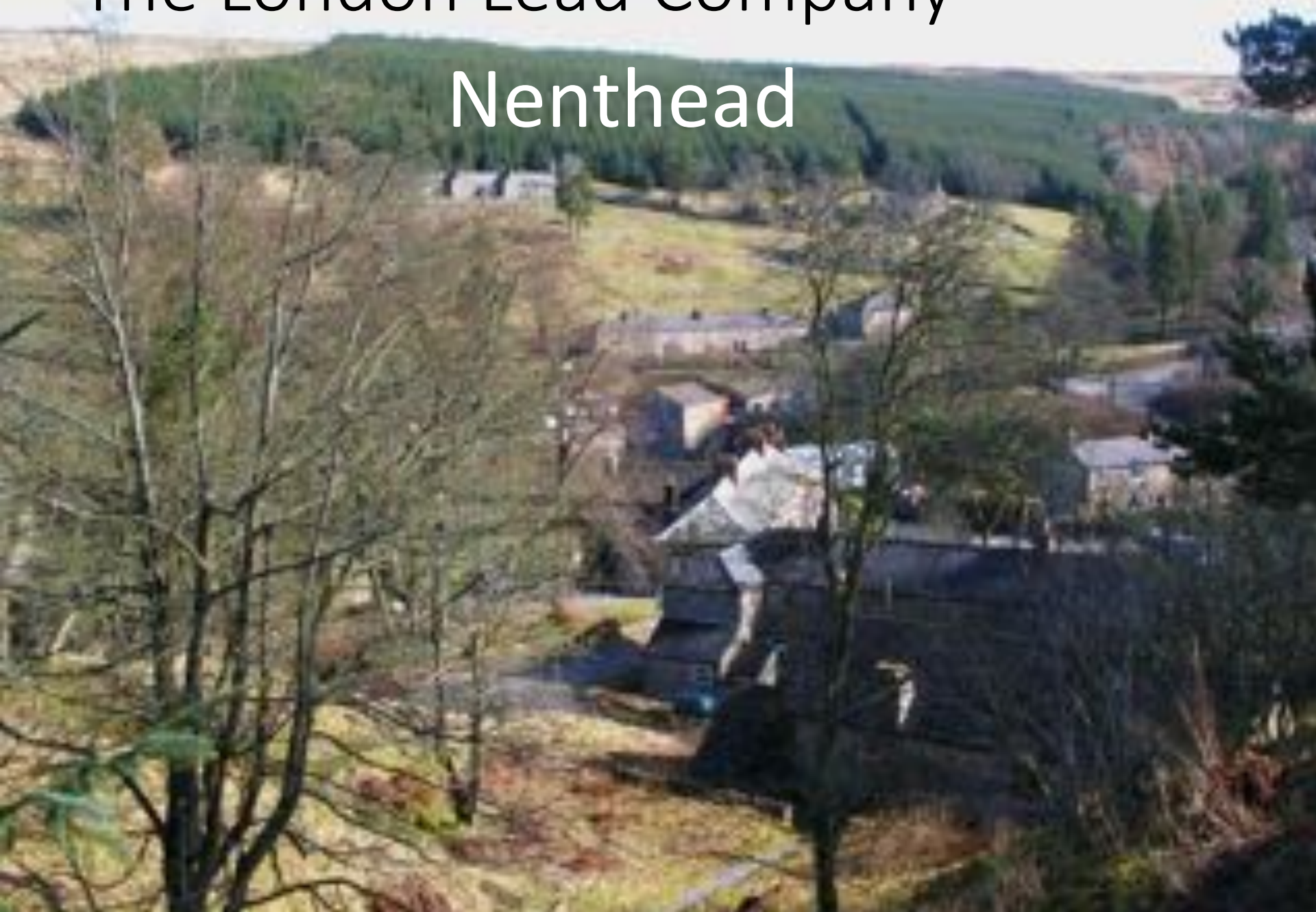
- North Pennines
 - London Lead Company
- Cornwall
 - William Cookworthy and china clay

The London Lead Company



The London Lead Company

Nenthead



The background image shows a wide-angle landscape of a valley. In the foreground, there are some bare, dark branches of trees or shrubs. The middle ground features rolling green hills with patches of brown earth, possibly from erosion or agriculture. A small cluster of buildings, likely a village or farmstead, is visible on a slope. The sky is overcast and grey.

The London Lead Company

THE LONDON LEAD COMPANY, 1692-1905

APPENDIX I.

CHARTER GRANTED TO THE COMPANY, 4th OCTOBER, 1692.

William & Mary. Unto all to whome these presents shall come, Greeting.

Whereas we are desirous to encourage the opening and working of lead mines, and yet nevertheless as far as the same may be done, to preserve the timber and wood growing in this our Kingdom,

And it having been represented to us by the petition of our trusty and well beloved subjects Constantine Vernatty Thomas Addison and Thomas Nix esquires, and John Moore and George Moore of London, Merchants, on behalf of themselves and others that they with great industry study and expense have by several furnaces ways engines methods and means not hitherto found out or put in practice a very useful way of smelting down purifying and refining lead ore with pit coal and sea coal and making the same into good and merchantable lead fit for all uses which will be of great advantage and use to this Kingdom in general by working and improving several lead mines which are now altogether neglected for want of wood to smelt and melt down the same and will save the consumption of great quantities of wood which are now daily spent in smelting of lead and will promote the vending of lead by reason the same can be smelted at cheaper rates by pit coal and sea coal than it can with wood.

And also humbly representing unto us that it will require a considerable stock effectually to carry on the said undertaking for the most advantage of the public and to that end have humbly besought us to incorporate them and others for the purpose aforesaid the better to enable them to manage and prosecute the same more conveniently

Know ye therefore that We, being desirous to promote the advancement of the said trade and commerce in this our Kingdom and to secure the benefit thereof to the public and by these presents for us our heirs and successors do grant constitute declare and give full power unto our trusty and well beloved subjects Constantine Vernatty, Francis Baker, Thomas Addison, and George Clarke, esqrs. and George Moore of London, Merchants, and such others as they or either of them shall think fit to employ in that behalf to do and execute all such things and matters as shall be thought expedient for the promoting and carrying on of the said society hereinafter mentioned shall be and shall be called one body corporate and politic in deed and in name by the name of "The Governor and Company for Smelting down Lead with Pitcoal and Sea Coal."

*Transactions of the
Newcomen Society, 1933*

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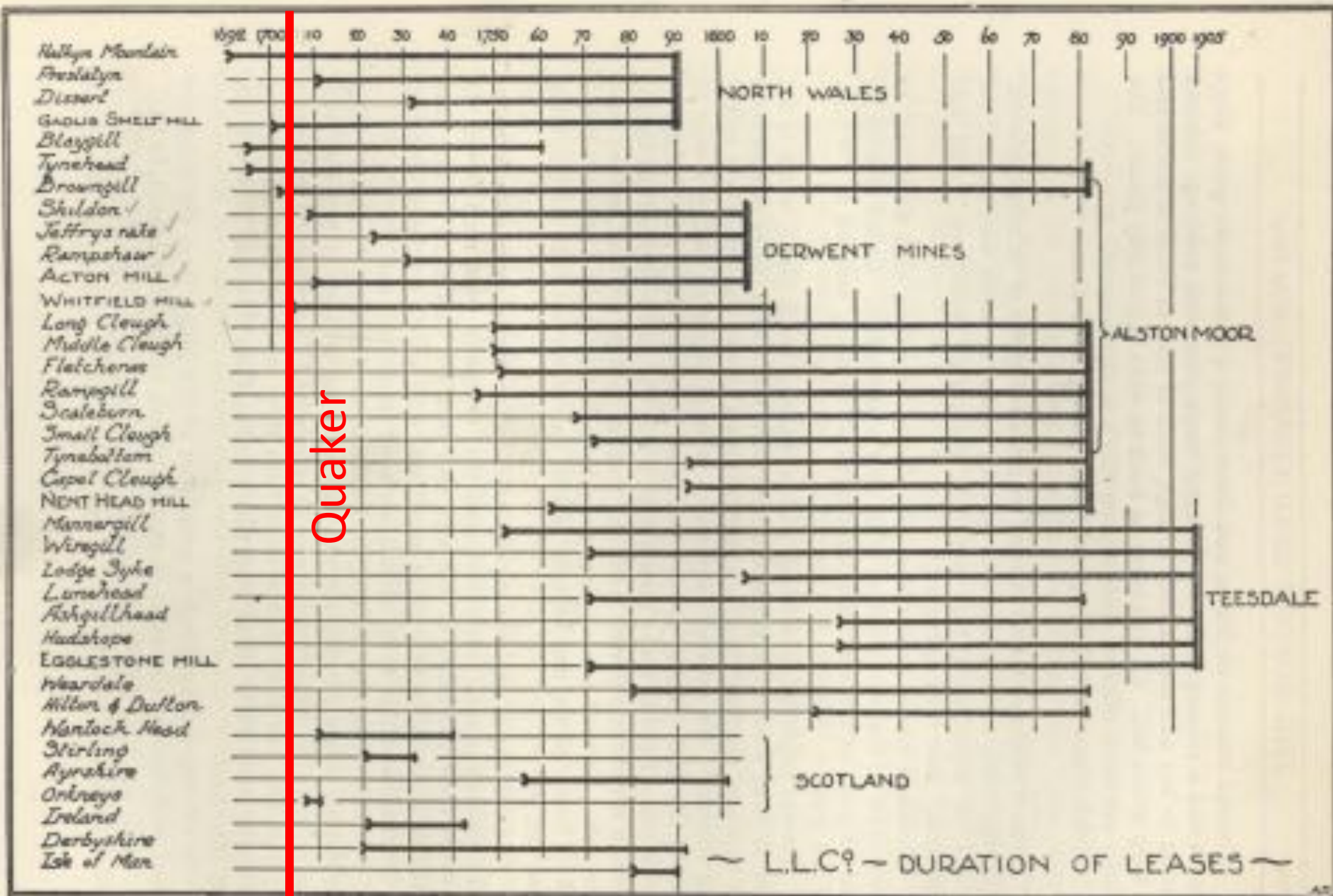
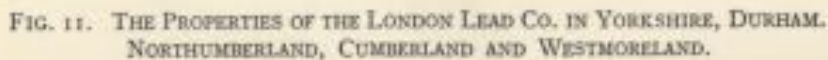


FIG. 10. PRINCIPAL LEASES OF THE LONDON LEAD CO.,
AND THEIR DURATION.

*Transactions of the
Newcomen Society, 1933*



The London Lead Company

- 18th and 19th century 1692-1905
- Had roots in the Ryton smelting company
- Operated/owned fully by Quakers from 1704 – 1905
- Owned coal mines at Coanwood
- Was concerned for the welfare of the miners and their families
- Built the village of Nenthead (1753 on) – school, water supply, public baths etc
- Thriving Quaker community in Allendale from the start of the 18th Century

The Quaker landscape: Rookhope



2451 m

© 2017 Infoterra Ltd & Bluesky

Google

The Quaker landscape: Rookhope



229 m

© 2012 Infoterra Ltd & Bluetky

Google

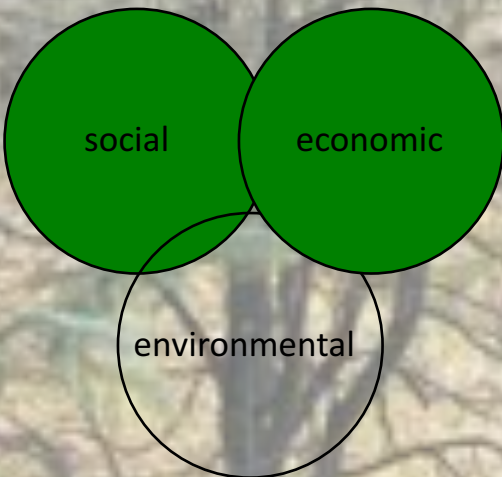
The London Lead Company



Legacy of old workings – now SSSIs and nature reserves
But also the major current cause of metal pollution in
catchments draining the mining region.

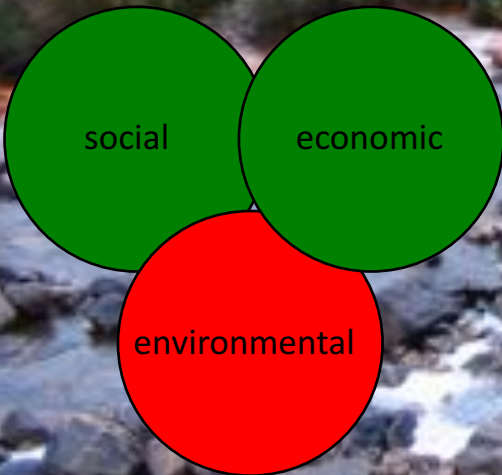
The London Lead Company

- Lasted 200 years – a commercial success
- Built real benefits for the community – which continue today



The London Lead Company

- Lasted 200 years – a commercial success
- Built real benefits for the community – which continue today
- Caused pollution that still bedevils the Tyne at Newcastle

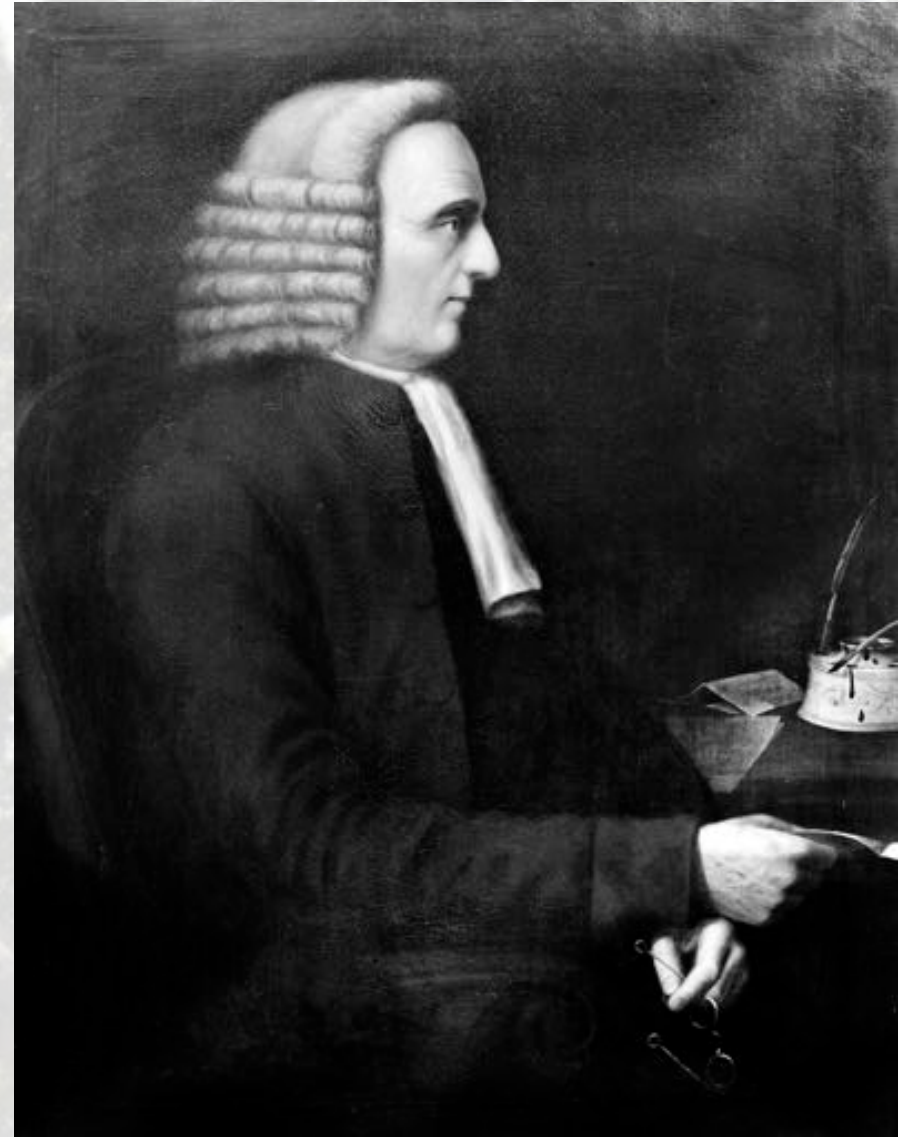


Mining in Cornwall



William Cookworthy

- Created the UK's china industry
- Developed china clay in Cornwall
- Used to make porcelain from the 1750s on



Cookworthy's legacy – St Austell today



Giant open pits



Cookworthy's legacy – Plymouth today



Drakewalls tin-
tungsten mine



Google 'hemerdon tungsten mine'
or 'Wolf Minerals'

Google Earth

Potash and the North York Moors National Park

- Cleveland Potash Ltd; mine construction started 1969 (ICI)
- York Potash Ltd – starting now

The following material comes from the company websites:

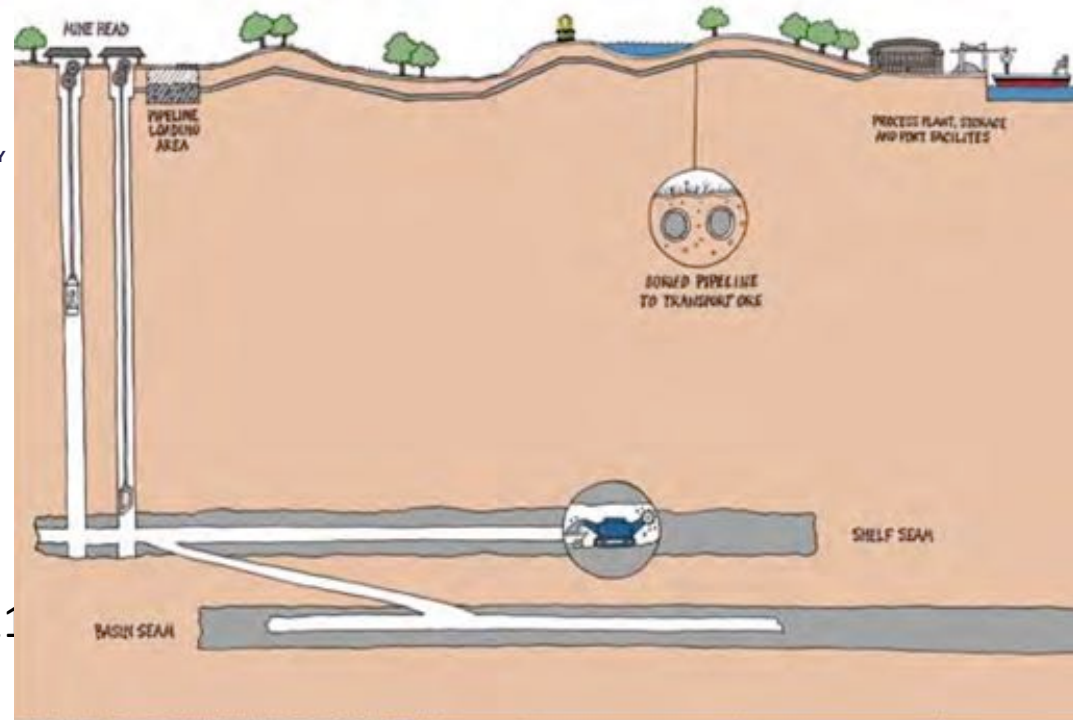
- <http://www.iclfertilizers.com/Fertilizers/ClevelandPotash>
- <http://yorkpotash.co.uk>

York Potash: a new mine in a national park



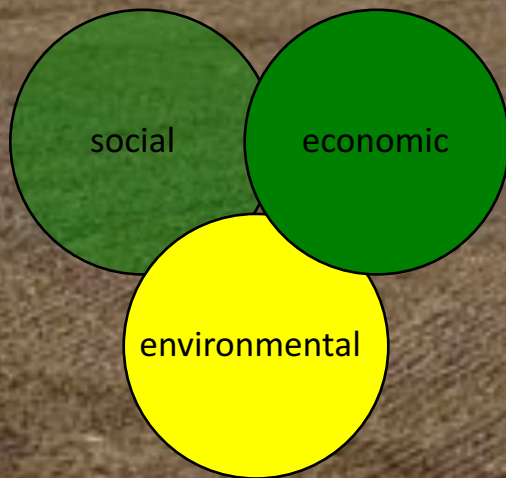
<http://yorkpotash.co.uk/mine-location/location/>

An invisible mine

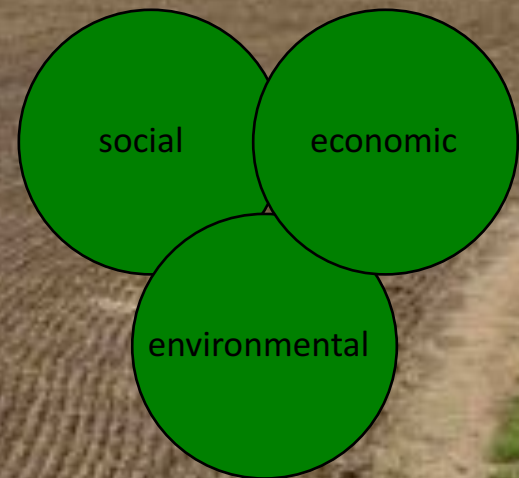


Potash in a national park

- Boulby mine – operating since 1969
- York Potash Ltd – starting now



1969



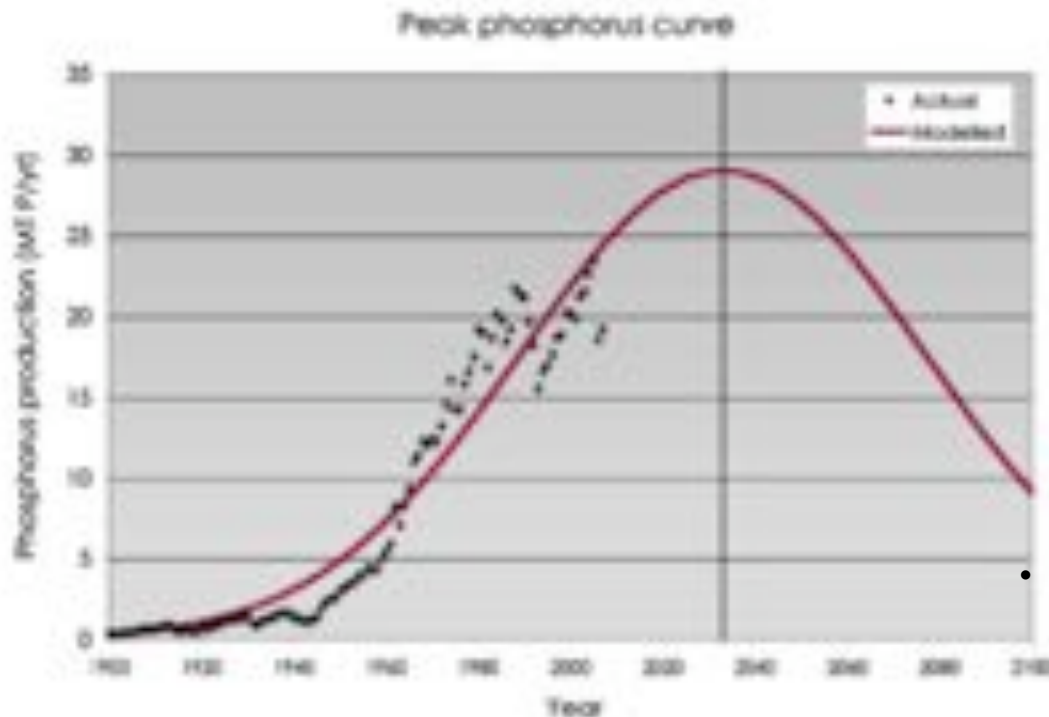
2013

What about other fertilizers?

- Peak Phosphorus
- Nitrogen fertilizers, the Haber-Bosch Process and the fossil fuel industry

Peak phosphorus

- People talk about 'peak phosphorus', based on analogies with oil

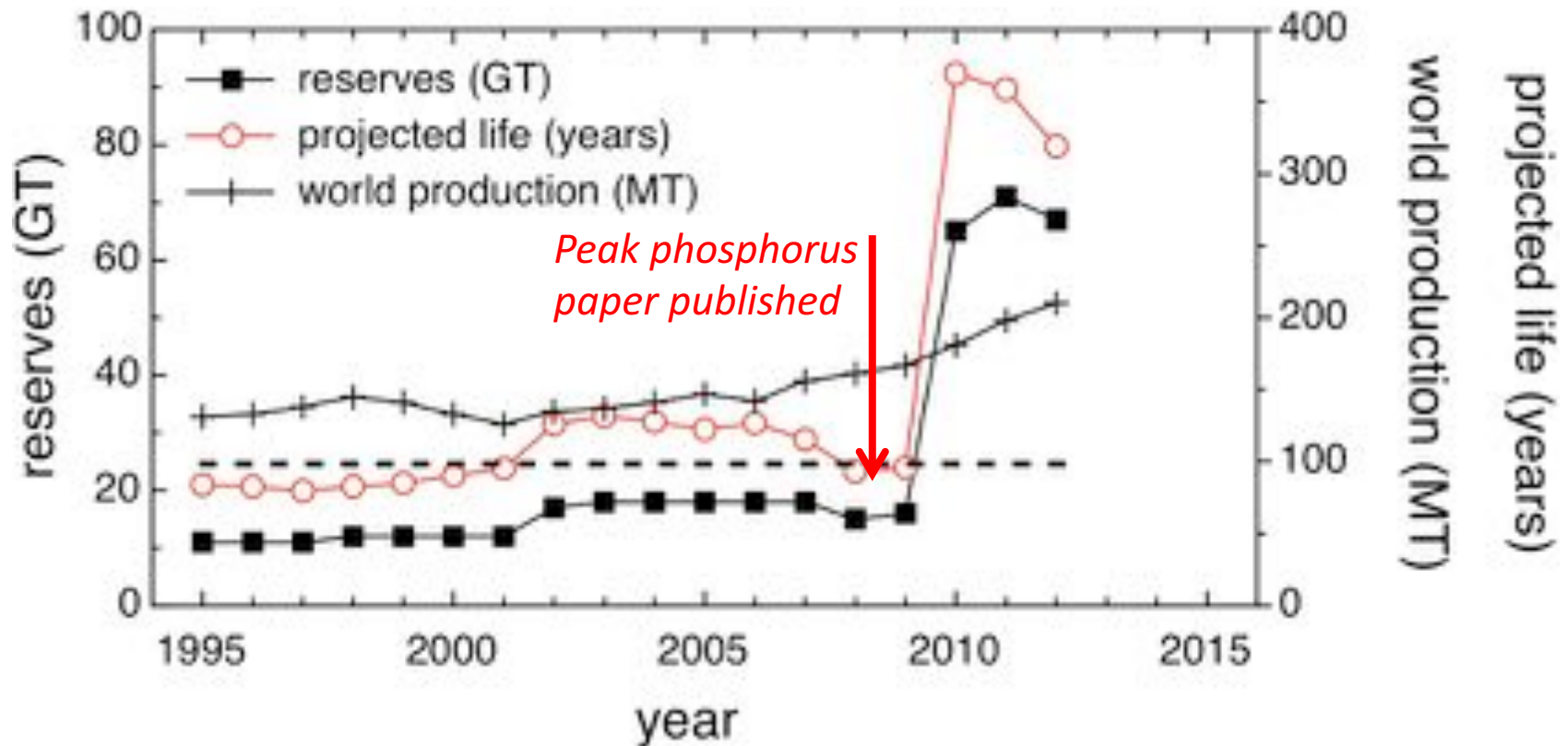


Published in 2009 –
things then changed

- Cordell, D., Drangert, J.-O., and White, S., (2009)
The Story of Phosphorus: Global food security
and food for thought. Global Environmental
Change, 19, 292-305

Phosphorus is not rare, after all

- USGS reports that there are 1600 known phosphorus mines, extinct, dormant, active.
- 3-400 years reserves after redefined in 2010

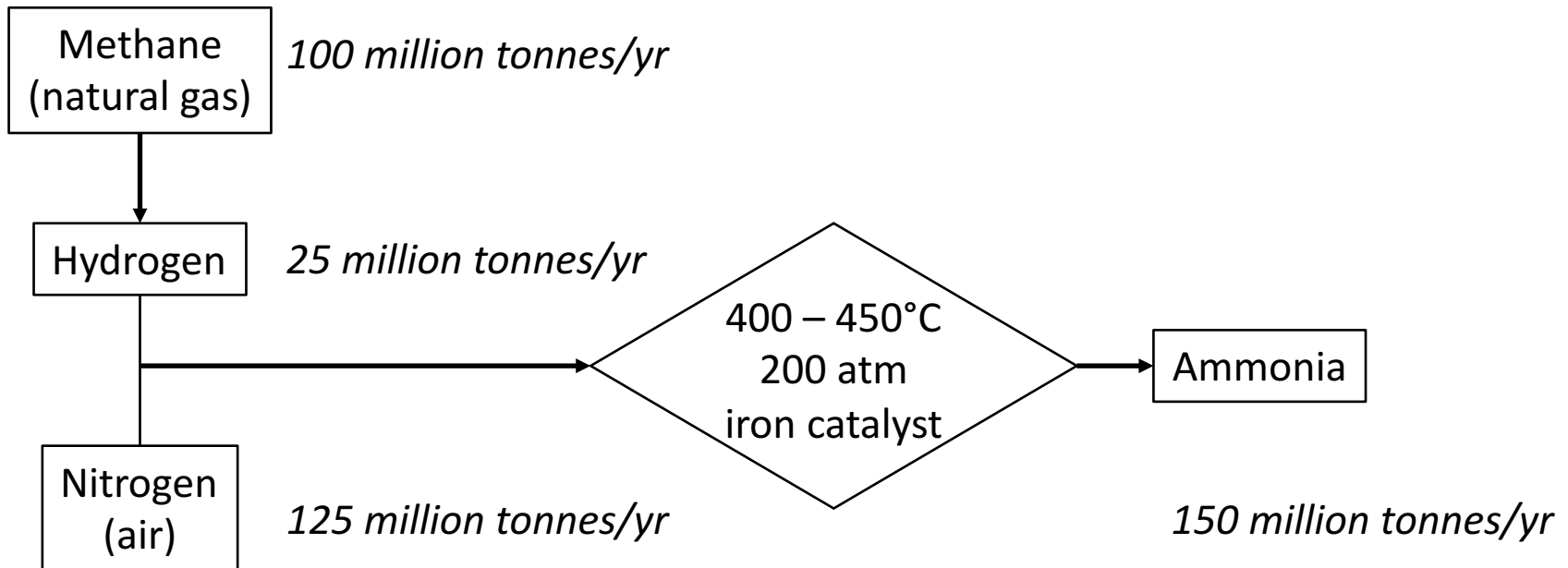


The Haber-Bosch Process

- Has enabled the world's population to rise from 2 billion to 7 billion in the last 100 years
- Uses 5% of the world's methane production – but as a raw material
- And 1% of the world's energy production

Is there an alternative to the Haber-Bosch Process?

- In a post fossil-fuels world, what is the alternative to:



Methane to make fertilizer

- 100 million tonnes a year is needed as a raw material
- Over 1500 of these ships:



Back to the Quaker approach



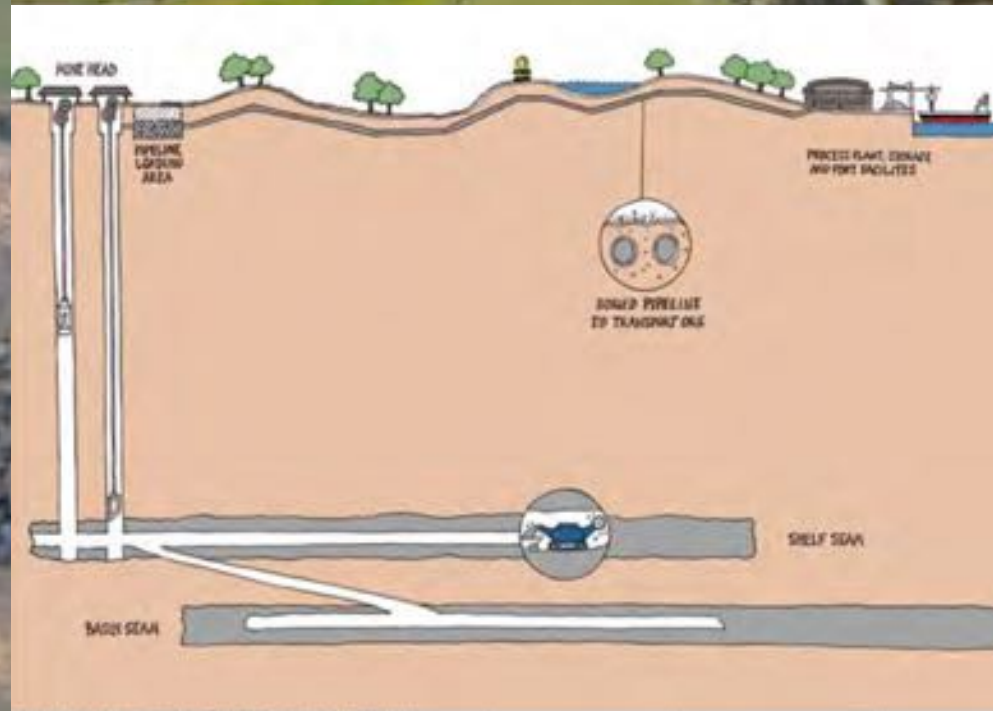
Mining, if carried out the Quaker way,
can address the needs of the poor



Mining is part of everyone's daily life



Mining needs Society's consent



What of the future?

- As populations and their prosperity grow, we will need more mineral raw materials
- But these only occur where they occur
- If they are found in the UK, we have a choice: we can mine 'at home' and control what happens
- Or we can import (if that is possible) and perhaps have no control over working conditions, environmental management etc

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- Or we can import (if that is possible) and perhaps have no control over working conditions, environmental management etc
- Quakers hold that there is 'that of God in every person'. That underpinned 200 years of running a mining company, and is just as valid now

Quaker faith & practice

Fifth edition

The book of Christian discipline of the Yearly Meeting of the Religious Society of Friends (Quakers) in Britain

We do not own the world, and its riches are not ours to dispose of at will. Show a loving consideration for all creatures, and seek to maintain the beauty and variety of the world. Work to ensure that our increasing power over nature is used responsibly, with reverence for life. Rejoice in the splendour of God's continuing creation.

Advices and Queries, no. 42