Revaluing NORM Residues:
The Circular Economy Dividend

NORM X, Utrecht May 9-13, 2022

Dr. Julian Hilton,
Chairman, Aleff Group
“The concept of sustainable development does imply limits - not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities”.

Gro Harlem Brundtland, Our Common Future, 1987
But we have now reached the limits of “the ability of the biosphere to absorb the effects of human activities”

Definitely time for thinking about things differently!

Time for the Holistic Approach
Welcome to the Anthropocene?

Urban mines... Invisible mining... Zero waste...

**Science & Environment**

**May 7, 2022**

**Mine e-waste, not the Earth, say scientists**

By Victoria Gill
Science correspondent, BBC News
@ 13 hours ago

**Why not mine all “waste”?**

The recycling of e-waste must urgently be ramped up because mining the Earth for precious metals to make new gadgets is unsustainable, scientists say.

**Red Mud**

**Phosphogypsum**

**Phosphate Mine Tailings**

**A report by RAGements**
All-Johnny Johnson, Guest Editor
Paris, January 2022

**PHOSPHOGYPSUM**
Sustainable Management and Use

**PHOSPHOGYPSUM LEADERSHIP INNOVATION PARTNERSHIP**

**NEW MATERIALS**

**OUR COMMON FUTURE**

**NORM**
Yielding the Continuous Life-Cycle Dividend... for ever: Valorising residues and tailings in a “Zero Waste” Circular Economy

Linear Economy

Primary materials

Production

Use

Disposal

0%

Reuse Economy

Primary materials

Production

Recycling

Use

Disposal

30%

Circular Economy

New materials

Production

Recycling

Use

Zero Waste

85%

Circular Economy Life-cycle Dividend yield

30%
“Zero Waste” in the Circular Economy

Principles

A (the?) defining principles of the circular economy are resource conservation and optimised use efficiency (Zero Waste):

a) The default condition is that accessing “primary” resources is necessary only when “secondary (reusable)” resources are not sufficiently available

b) The Linear economy is broken: “Extractive” industries have lost public trust and confidence require a new, “circular” narrative, based on redefined “life-cycles” for all resources

c) All resources stay within the system boundary, even if no foreseeable solution to their current status as “waste” is available

d) Resources should be managed in “nexus” structures, based on meeting essential SDG needs – Food: Energy: Water (FEW) and within a new Social Resource Contract

e) Risk/benefit models and algorithms need to be fundamentally rethought
"End of Waste" in the Circular Economy: Time for NORM Industries to reboot?

Actions

a) Adopt and apply Sustainable Development Goals (SDG) as an essential condition for resource management. See SDG 12: Responsible Production and Consumption

b) The regulator has to create the conditions for NORM industries to serve equally and equitably the needs of People: Planet: Prosperity. This means it must accompany the entire resource life-cycle, and in its new circular form.

c) NORM regulation must pivot away from a one-dimensional approach, exclusively about “safe” waste management and disposal and returning to the graded, holistic, evidence-based approach it has neglected.

d) Regulation must be empirical not deterministic as “the present state of technology and social organisation” evolves. Stakeholder engagement and the Social Licence to Operate (SLO) are key.

e) Government and industry must investing in making the necessary tools and instruments for regulators to do this (for example to meet new Environmental, Social and Governance (ESG) finance and investment requirements)?
Global mining and metals top 10 business risks and opportunities – 2021

Top 10 business risks and opportunities

1. License to operate
2. High-impact risks
3. Decarbonization and green agenda
4. Productivity and rising costs
5. Capital agenda
6. Geopolitics
7. Workforce
8. Volatility
9. Digital and data
10. Innovation

Why is the Social Licence to Operate at no.1 in the list of Business Risks and Liabilities for the Resources Industries, where it has been for several years, especially for NORM-related industries?

How is the mix of “toxic intangibles” fear (eg of “radioactivity” among operators and stakeholders) confusion and uncertainty (especially among operators) as to how to be compliant with NORM regulations, especially for reuse of residues when they are so inconsistent and often incoherent nationally, even within countries, regionally and worldwide. Ie is this a problem of our own making not inherent to the risks posed by the materials themselves if properly managed under a graded, holistic approach?

How can this “Triple Bottom Line” negative impact be revisited within a holistic, circular economy framework and converted into a sustainable long-term tangible and intangible, equitably shared, long-term common dividend from

1. valorising NORM (and other) industry residues, especially those with very high volumes,
2. returning to economically productive use the many thousands of hectares of land lost to disposal, and
3. thereby restoring depressed land values blighted by the proximity of these materials?

There are success stories already, in place but not generally known and understood...
Our Common Future

License to operate (1): Remains the number one issue for miners, with 63% of our survey respondents flagging it as a top three risk. We expect the issue to become even more important as stakeholders broaden and develop a stronger voice. As effective engagement becomes even more critical, we believe miners should consider three tiers of community:

- Local communities will have greater expectations around how miners respect Indigenous rights and native title.
- National communities may push for a return to resource nationalism, with increased debate around who miners sell to and for what purpose.
- Broader community commitment will come into focus as socioeconomic issues are highlighted post-COVID-19. We may see pressure build to provide ownership of assets to communities.

57% of the value of Mining and Processing Companies is Intangible: The SLO is a key part of the Zero Waste Dividend

Time (overdue?) for a rethink?
Time for adopting a Social Resource Contract
to regain trust and confidence and to mirror
the accelerating trend to Environmental, Social
and Governance (ESG) related financial and
investment instruments?
The Extractives Linear Model is Broken
Fixing it – Climate Action and the Circular Economy transition

- Extractive industries have immense potential to drive growth, support sustainable development, and reduce poverty in developing countries. Yet, the actual contribution of extractive industries to sustainable development in countries rich in raw materials has often been mired by financial, economic, governance, social and environmental concerns, leading to the so-called resource curse or paradox of plenty.

- In effect, the abundance of raw materials has often locked many developing countries into patterns of primary product export specialization, constituting a barrier to long-term economic development.
ESG Matters

Posted by Subodh Mishra, Institutional Shareholder Services, Inc., on Tuesday, January 14, 2020

Tags: Capital allocation, Climate change, ESG, Firm performance, Institutional Investors, Profitability, Risk, Risk management, Sustainability

More from: Anthony Campagna, G. Kevin Spellman, Subodh Mishra, Institutional Shareholder Services Inc.

Editor’s Note: Subodh Mishra is Managing Director at Institutional Shareholder Services, Inc, G. Kevin Spellman is a Senior Advisor, and Anthony Campagna is Global Director of Fundamental Research at ISS EVA. This post is based on their ISS memorandum. Related research from the Program on Corporate Governance includes Socially Responsible Firms by Alan Ferrell, Hao Liang, and Luc Renneboog (discussed on the Forum here); Social Responsibility Resolutions by Scott Hirst (discussed on the Forum here); and Reconciling Fiduciary Duty and Social Conscience: The Law and Economics of ESG Investing by a Trustee, by Max M. Schanzenbach and Robert H. Sitkoff (discussed on the Forum here).

Summary

• High/favorable ISS ESG Corporate Rating performance is Generally Positively Related to Valuation and Profitability and Negatively Correlated with Volatility
• High/favorable ISS ESG Corporate Rating firms are Good Allocators of Capital
• High/favorable ISS ESG Corporate Rating Performance / High-EVA Margin Stocks tend to Outperform
• High/favorable ISS ESG Corporate Rating Firms Tend to be Less Cyclical and are More Likely to be in the Technology, Health Care, and Consumer Non-Durables Sectors
Firms with the best ESG rankings financially outperform peers by 40%+.³
Nordea Equity Research

Six environmental objectives of the EU taxonomy

1. Climate change mitigation
2. Climate change adaptation
3. Sustainable use and protection of water and marine resources
4. Transition to a circular economy, waste prevention and recycling
5. Pollution prevention and control
6. Protection of healthy ecosystems

Source: EU TEG on Sustainable Finance, Taxonomy Technical Report, June 2019
Partnership for Constructive (win-win-win) Regulation$^1$ of PG

Partnership (SDG 17) is fundamental to all progress

Partnerships between:

- Industry and partners (JVs/ long-term customers)
- Government
  - Investor
  - Regulator
  - Standards
- Academia
  - Science and technology innovation (national and international)
  - Independent validation

Government
Policy, regulation, investment, incentives
& International Agencies eg UN

Industry
Phosphate and Partners – agriculture/forestry, materials, roads...

Academia
Evidence and science innovation
Peer review
No conflict of interest

100% PG Use

Together - We can do this

IAEA Environet WG 5
NORM Residue Valorisation in the Scope of the Circular Economy

Terms of Reference available for review and comment – please ask Horst or me

Work Plan - Runs 2 years: January 2022 – December 2023, well underway now

Key findings to date:

1. Must be holistic, inclusive, stakeholder oriented approach – empirical not deterministic
2. New NORM regulatory model/ paradigm required – circular economy enabling/ compliant
3. “Zero discharge” ambition (as derived from NPPs) unrealistic and unnecessary to maintain safety
4. Capabilities to deliver must be in place – competency analysis and training required
5. Case studies to scale, lessons and success stories essential for mapping transition pathways
6. Access to market and related conformity statement or approval mark (eg CE product mark)
7. Fits well with IAEA broader Circular Economy alignment initiative
NORM Residue Valorisation
Stretch Goal - 98:2
Zero Waste - PG use as Soil amendment and roadbed

PG Production 215 mt/y
Consumption ~80mt/y ↑
Legacy 4-5 million tonnes
Goal 100% use incl. legacy

PHOSPHOGYPSUM

CHARACTERISATION

<table>
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<tr>
<th>238Ra</th>
<th>210Pb</th>
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<tr>
<td>&lt;&lt; 1Bq/g</td>
<td>1 OR MORE CRITICAL METALS &gt; LIMITS</td>
</tr>
<tr>
<td>ALL METALS &lt; LIMITS</td>
<td>1 OR MORE CRITICAL METALS &gt; LIMITS</td>
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USE OPTIONS

All uses:
- Agriculture
- Construction
- Construction materials
- Landfill
- Roads etc

All uses:
- BUT
- Graded approach to construction use for dwellings

- Co-product recovery/sulphur
- Landfill cover
- Non-residential construction
- Graded approach
- Agriculture
- Limited approach
- Construction use/dwellings

REGULATION

No pathways of concern:
“Out of scope”

Inhalation pathway limiting:
Case by case for dwellings

Inhalation, ingestion and environmental pathways of concern:
- Targeted uses
- Revised exemptions

GRADED APPROACH

Without PG

Coffee, Brazil

With PG

Barley, Morocco

India

Soil amendment Russia

Knauf/Prayon PG

Plaster Mine Belgium

Forestation/CO₂ Sequestration, Canada

150 cm root layer

Roads, Russia

PG Production 215 mt/y
Consumption ~80mt/y ↑
Legacy 4-5 million tonnes
Goal 100% use incl. legacy
Innovation and Infrastructure

Innovation (SDG 9) is sometimes about optimisation, sometimes disruption.

New...
❖ Processes
❖ Materials/ combinations
❖ Products
❖ Data
❖ Projects....

PG Case Studies
✓ Forestry/ Agriculture
  o Soil remediation
  o Crop yield
  o Nutrient efficiency
  o Water efficiency
  o CO₂ sequestration
  o S/ Ca rich fertilisers
  o Anthrosols
✓ Materials/ combinations
  o PG/ flyash
  o PG tailings
✓ Products
  o Plaster/ wallboard
  o Zypmite
  o Ceramics
  o Roads
  o Growth media
✓ Projects
  o 100% use
Our Common Dividend: Social and Environmental Drivers

- Broken linear model with “baked in” assumption that waste disposal is a cost of doing business

- Progressively eliminate negative externalities – the negative consequences of unjust or inequitable contracts, rectify the damage caused by exploitative labour practices, engage in a positive and supportive manner with artisanal and small mining businesses, mitigate the costs and damage to public and environmental health pollution, contamination, emissions, imposed on future generations from past and current bad practices

- Through circularity and good sconce transform these negatives into positive internalities – value-additive resource management across the supply and value chains engaged in the complete life-cycle management to the benefit of employees, stakeholders, communities at national regional; and international levels

- Restore public confidence in these industries by credible science, elimination of conflicts of interest and corruption, stem and stop illicit flows of funds and materials

- Deploy transformative digital technologies such as blockchain, AI, drones and satellite data
Our Common Dividend and the New Point of Equilibrium

The Triple Bottom Line

- Financial
- Social
- Environmental

Either we all win — or we all lose

People

Planet

Prosperity

Environmental-Economic Accounting meets John Nash meets Brundtland meets ESG
References: Reconnection and the Triple Bottom Line

- The UN Sustainable Development Goals, 2015
- Klaus Schwab, Peter Vanham, Stakeholder Capitalism: A Global Economy that Works for Progress, People and Planet, January 6, 2021
Let’s build our common NORM future for Our Common Dividend
Thank you!

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