



# SD06

[www.minerals.org.au/sd06](http://www.minerals.org.au/sd06)

SD06: OPERATING FOR  
ENDURING VALUE

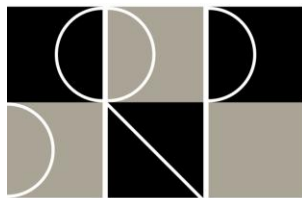


**Stevan Green – CEO**

**Erica Smyth -Independent Director**

**CRC for Sustainable Resource Processing**

**Developing Innovative Technologies in Support  
of Sustainable Minerals Processing**



Centre for  
Sustainable  
Resource  
Processing

# Sustainable Resource Processing

## Sustainable Resource Processing is:

- > part of Sustainable Development
- > concerned with the efficient use of water, energy and reagents; the minimisation of waste and eco-toxicity; and resource efficiency

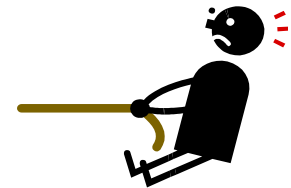
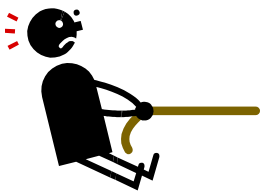
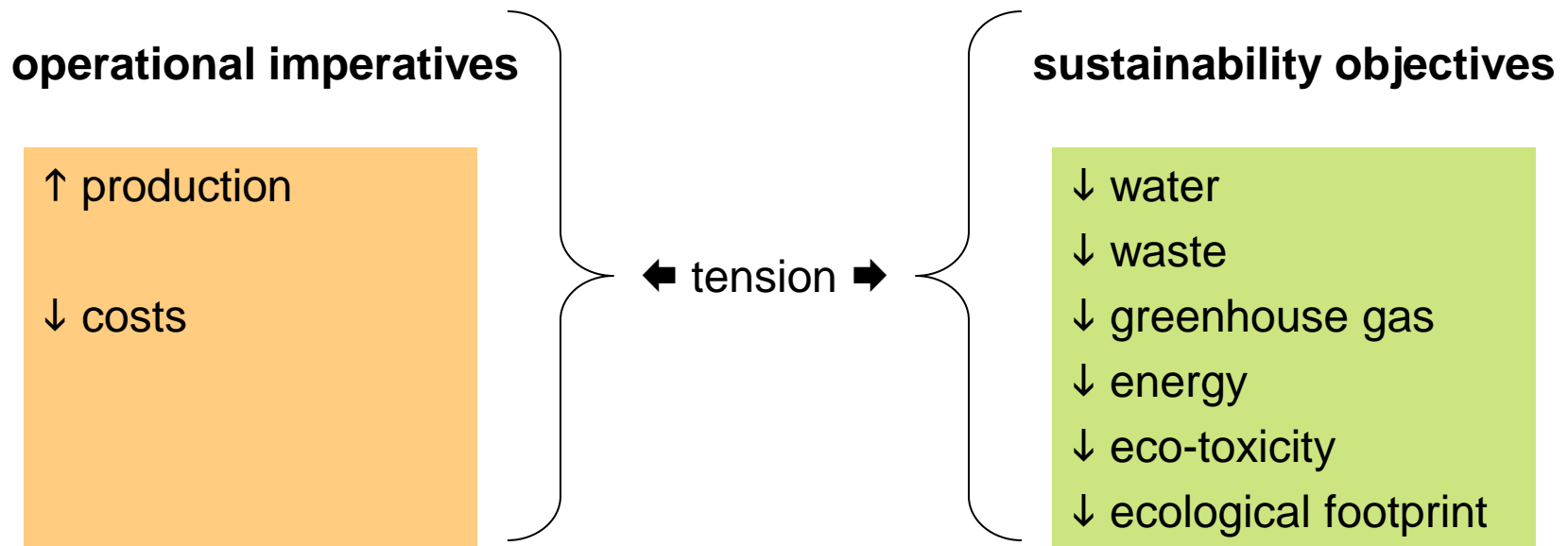
## In effect it is: **Doing more minerals processing with less**

- > **More:- tonnes moved, more time operating, more resource extracted**

**with**

- > **Less:- cost, water, energy, waste, ecological footprint**

## However, the world is changing...



## CSRP Research Frame

### Multi Industry Sector

[construction, minerals processing, mining, agriculture, infrastructure]

**Minerals Industry as a whole** [energy, water, waste]

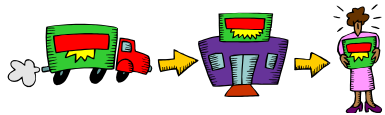
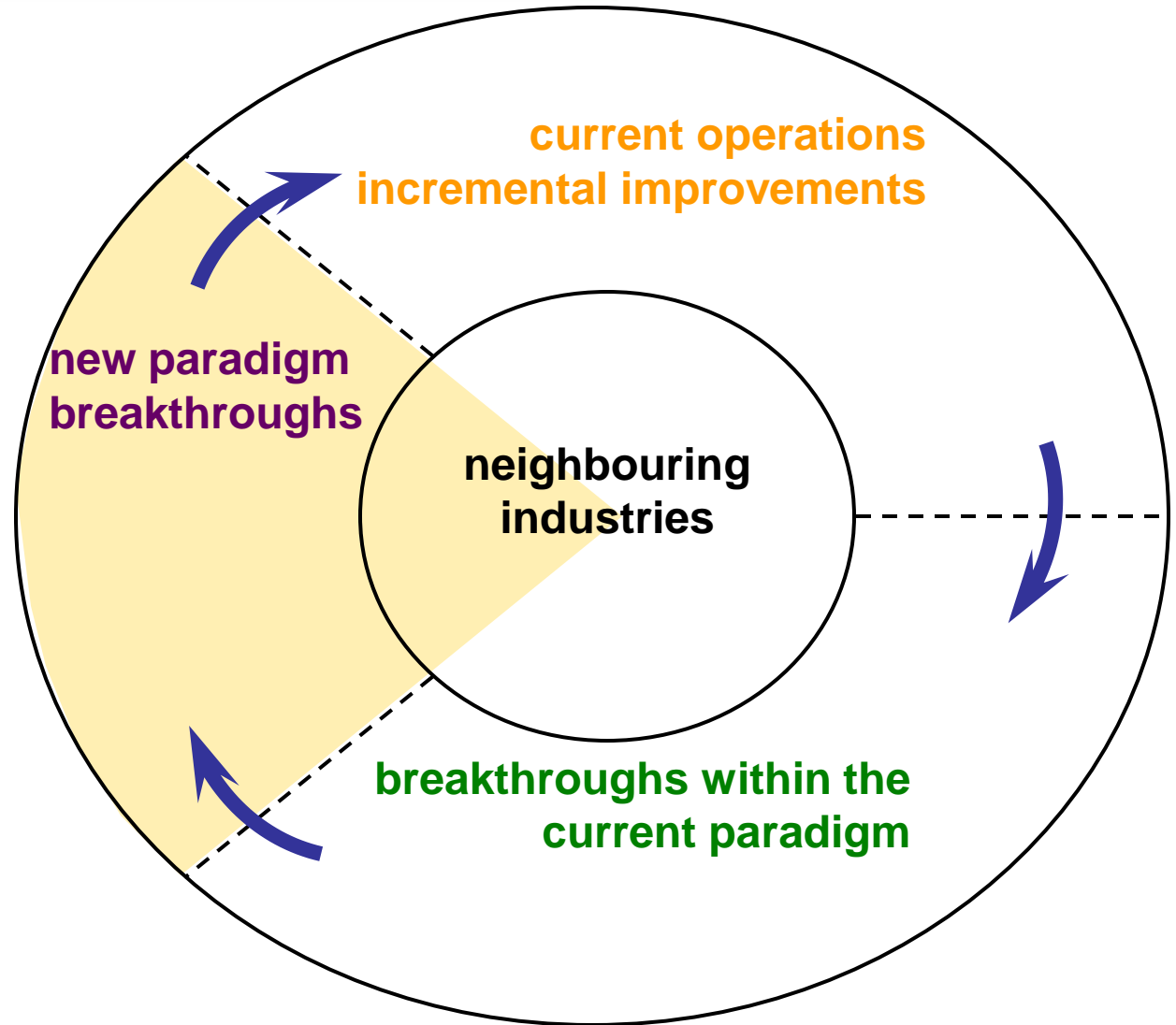
**Cross Commodity** [regional synergies]

**Single Commodity** [Al, Ni, Fe]

**Single Site**

# Sustainable Resource Processing

Research Focus

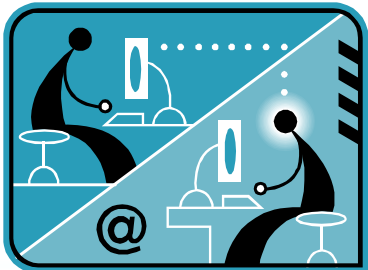


# Let's look at an example

- > CSRP and its Participants have a very significant ore preparation program investigating efficiencies in circuit designs and unit operations, including:
  - screening
  - crushing
  - milling
  - separation / liberation
- > The main focus to-date has been on decreasing the energy required for ore preparation.
  - Note that **in Australia ~14% of all produced electricity is used in ore preparation** and only a small fraction of this is actually required to achieve effective liberation of the target material.
- > To reduce the energy demand, CSRP is investigating:
  - more efficient comminution techniques
  - better coarse liberation processes
  - **modelling of comminution machines to allow for optimisation of design and operation of the large pieces of equipment**

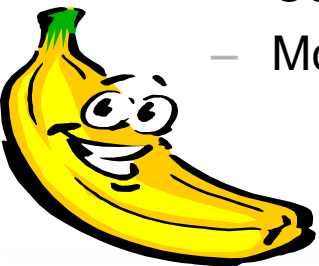
## A Powerful New Modelling Tool

- > Part of the work included modelling the efficiency of screening to reduce energy demand in the ore preparation circuit.
- > Through a combination of DEM (Discrete Element Method) and physical scale modelling, a **powerful modelling tool** is being developed to optimise mineral **ore screening processes**.
- > When applied to banana screens (which are widely employed in the iron ore and coal sectors) the result is far greater than simply energy savings.

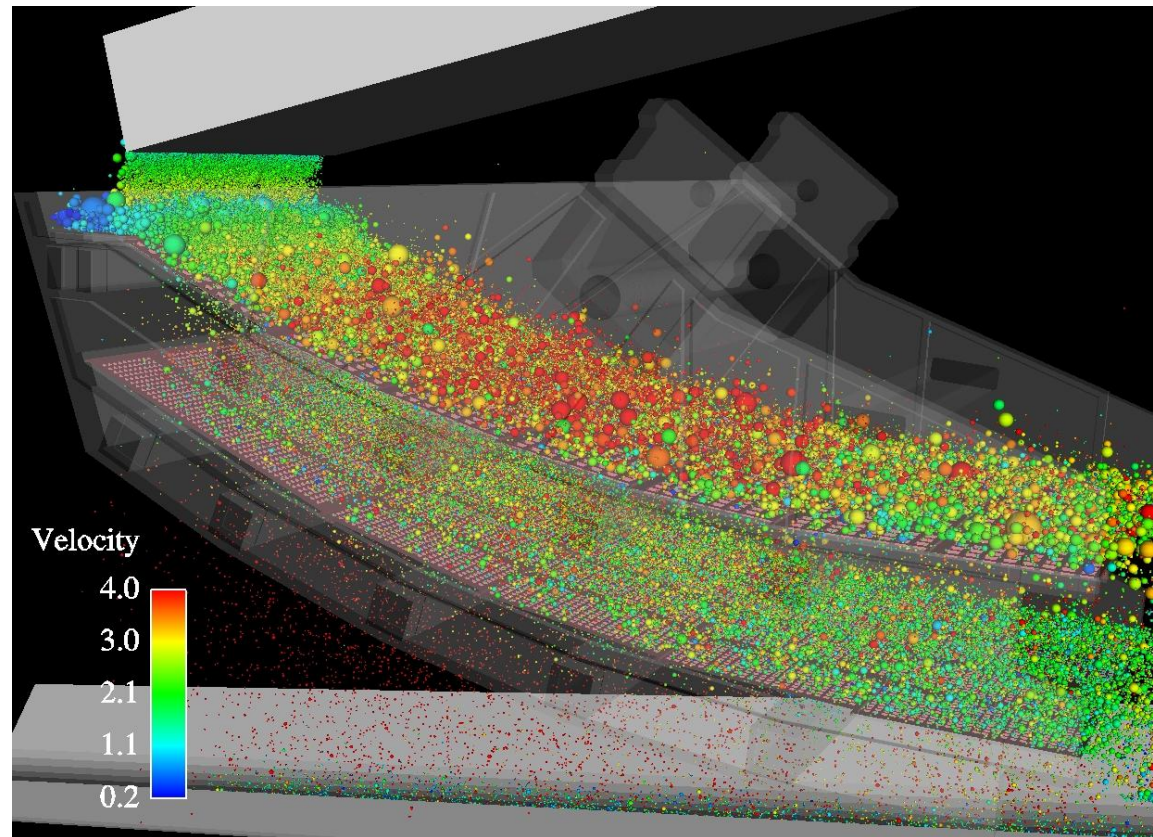


## Collaboration – Banana Screens

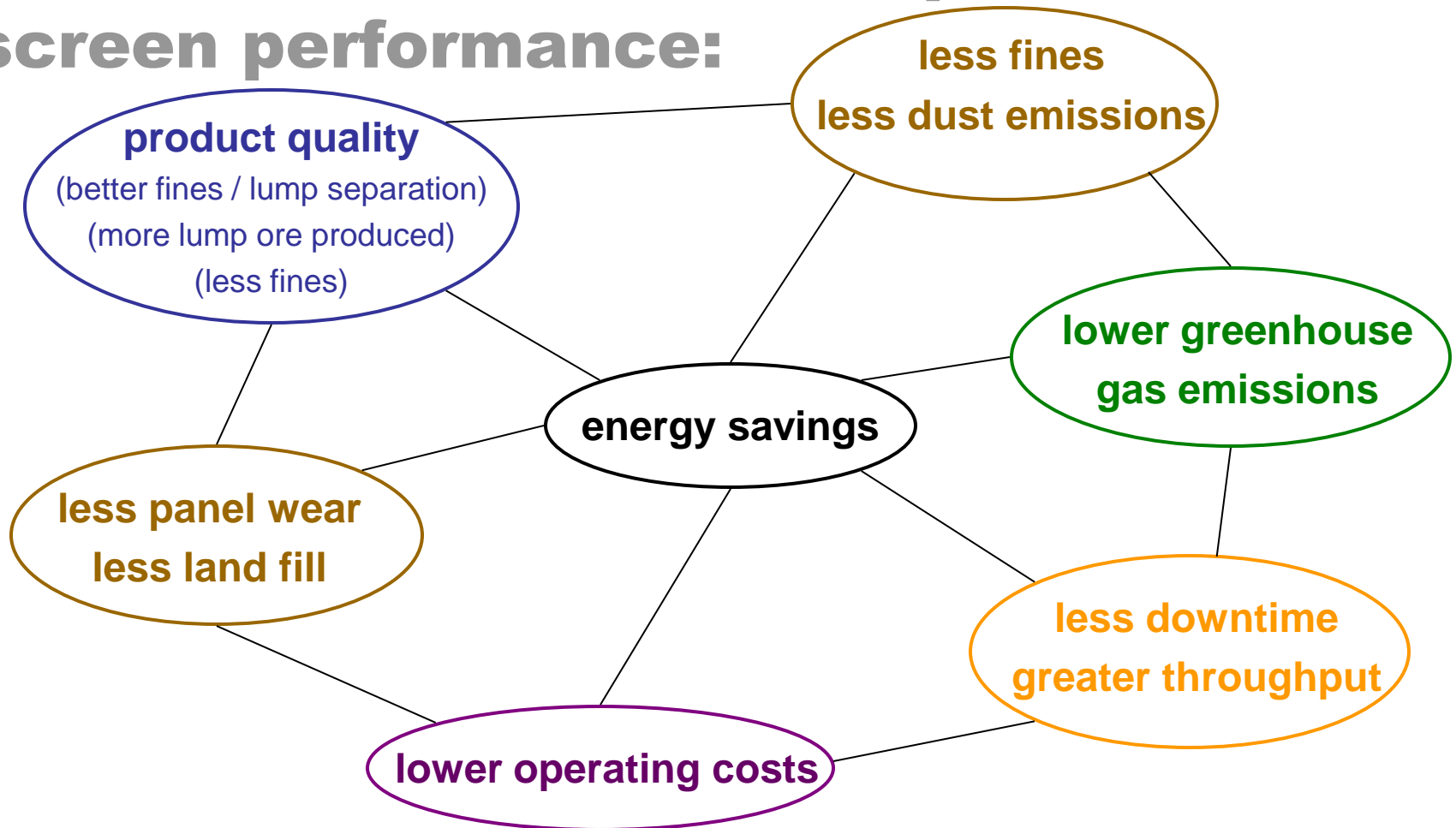
- > A powerful new screening model only came about because of the collaboration enabled by CSRP.
  
- > Research collaborators included:
  - Julius Kruttschnitt Mineral Research Centre / University of Queensland
  - CSIRO Mathematical & Information Sciences, Melbourne
  - CSIRO, Lucas Heights
  - University of Cape Town
  - Curtin University of Technology
  - McGill University, Canada



## Banana Screen Numerical Model

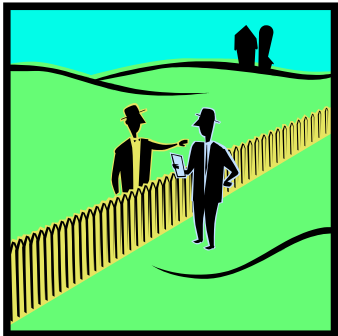
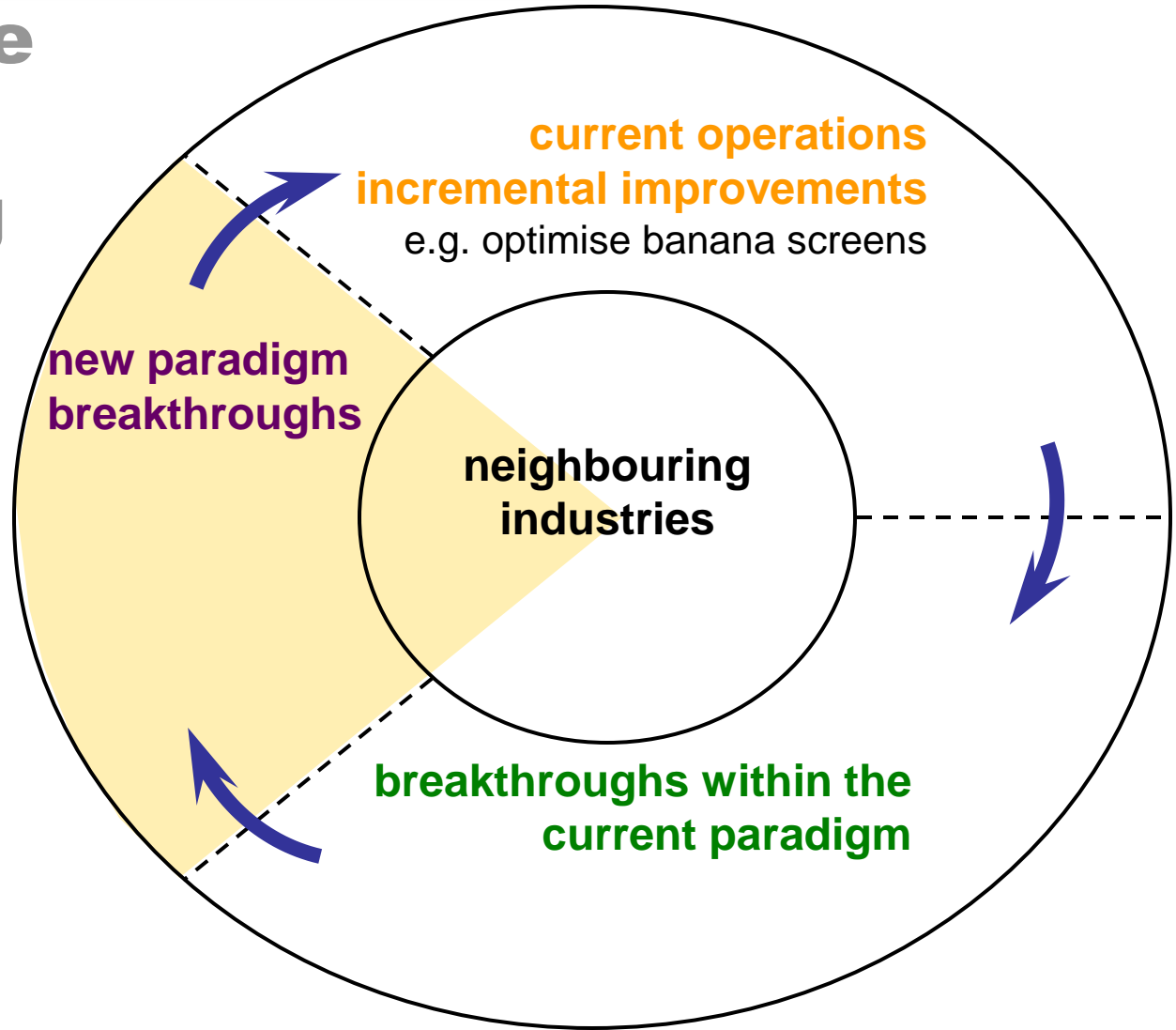


## Benefits available from improved screen performance:



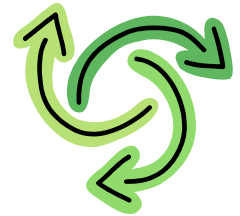
# Sustainable Resource Processing

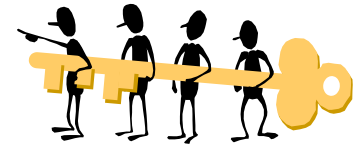
Research Focus



## Collaboration

- > Another example of the work of collaboration is from CSRP's work in **Regional Synergies**:
  - CSRP has developed a tool to assist in the identification and screening of synergies in industrially intensive regions
  - work began with Kwinana (WA) and Gladstone (Qld)
  - now extending to Geelong (Vic), Wagga Wagga (NSW), Rustenburg (South Africa) and hopefully soon to Kawasaki (Japan)





## Regional Synergies

establish the “group think” and industry enthusiasm

apply the **Synergy Identification Tool**

synergy opportunities for screening/consideration

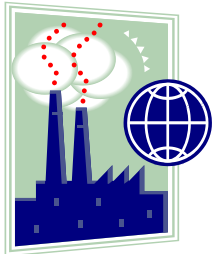
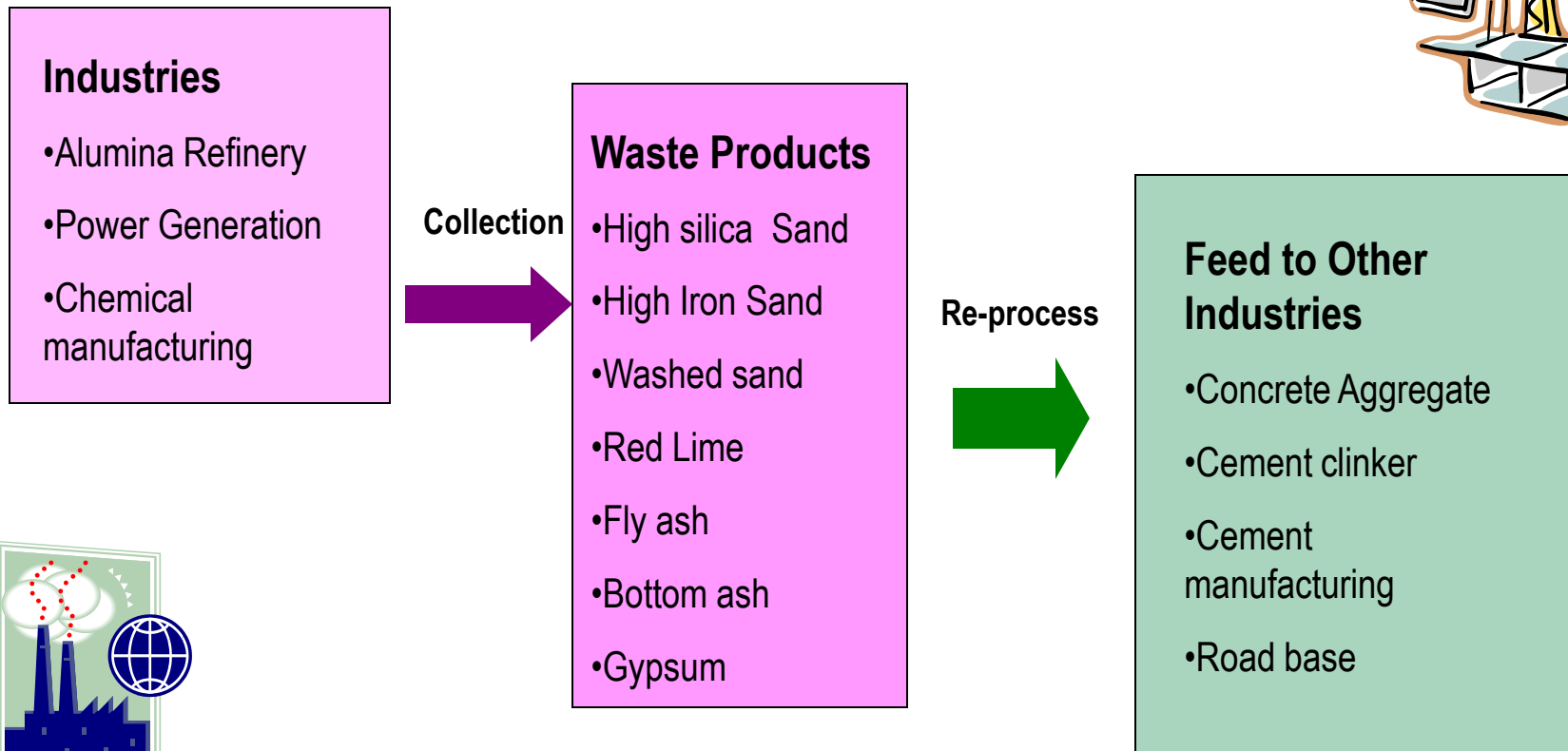
apply the **Synergy Screening Tools**

*“synergies exist  
in water, energy  
and waste  
minimisation”*

implement synergies/demonstrations

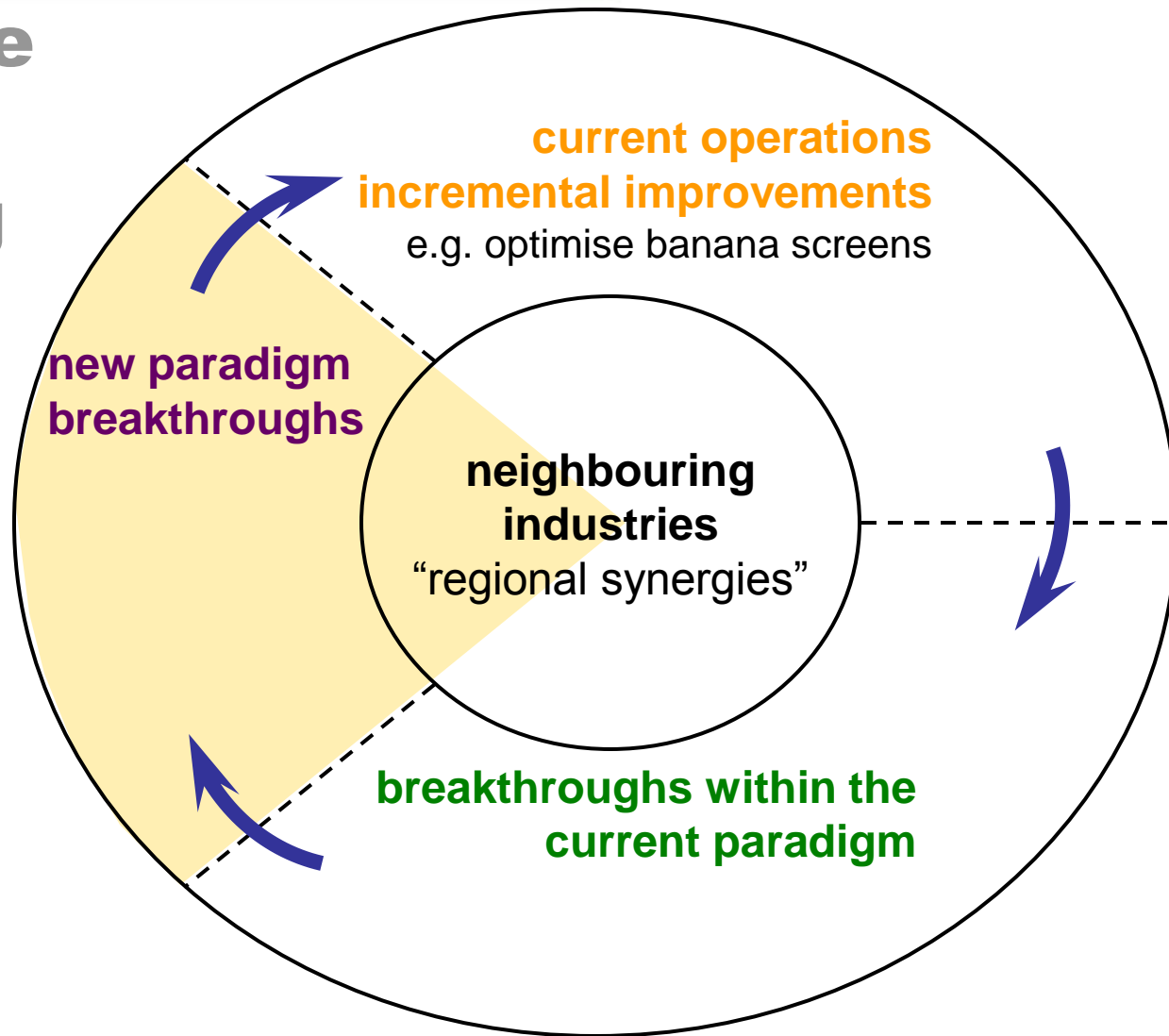
# Kwinana Industry Council Opportunities

## e.g. Inorganic Bi-products



# Sustainable Resource Processing

Research Focus



# Geopolymer Concretes

## Benefits:

- > backfill strength and chemical stability
- > waste utilisation
- > reduced greenhouse emissions through lower use of Ordinary Portland Cement (OPC)

## CSRP are investigating the following **potential uses**:

- > general purposed concrete (with specific properties e.g. acid resistance)
- > road making (especially heavy haulage site roads)
- > mine backfill / stabilisation
- > concrete stabilisation of minor elements
- > mine closure



**IMAGE 01: geopolymer samples**



**IMAGE 02: strength testing**

# Eco-Sand™

Eco-Sand™ is a replacement sand for the construction industry sourced from by-products of mineral processing.

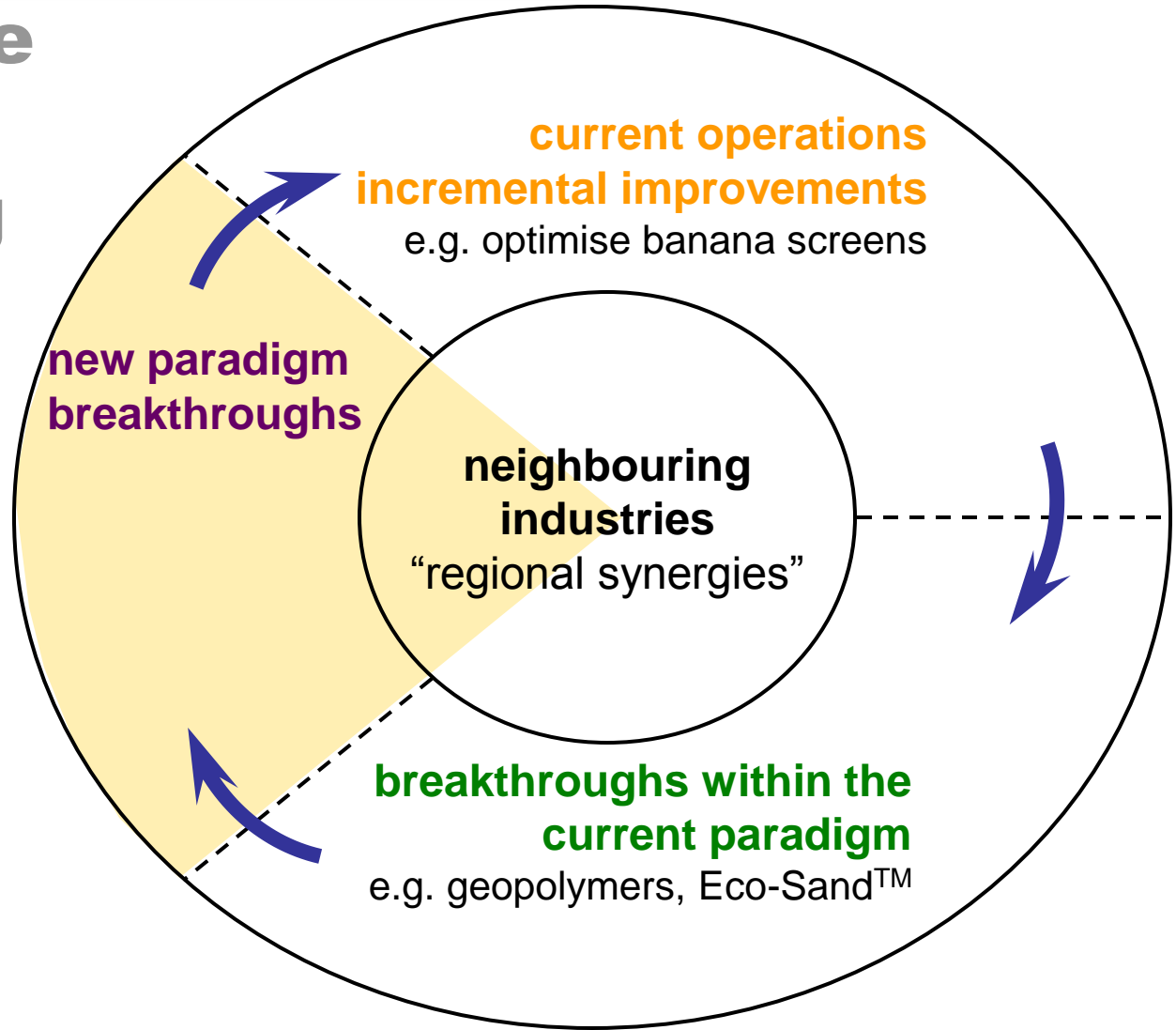
## Eco-Sand™

- > increases waste utilisation and resource efficiency
- > means fewer construction industry quarries, leading to:-
  - less removal of native vegetation
  - less acid drainage
  - less dieback distribution
  - less greenhouse gas emission (potentially)
  - less haulage (potentially)
- > lowers the cost of infrastructure materials
- > lowers the cost of resource industry waste storage



# Sustainable Resource Processing

Research Focus



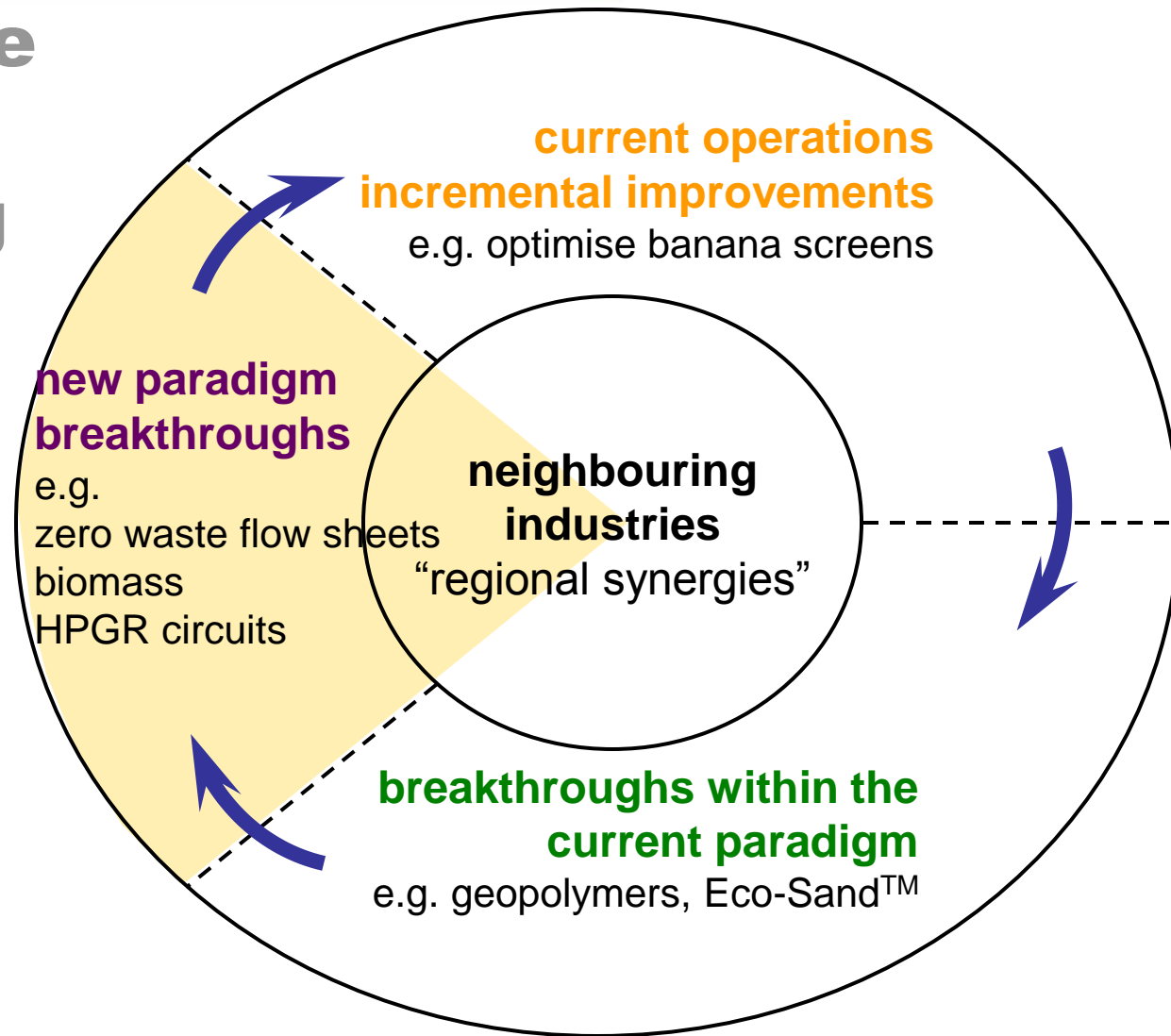
## More Sustainable Processing Alternatives

Other **leading edge sustainable processing alternatives** being researched by CSRP include:

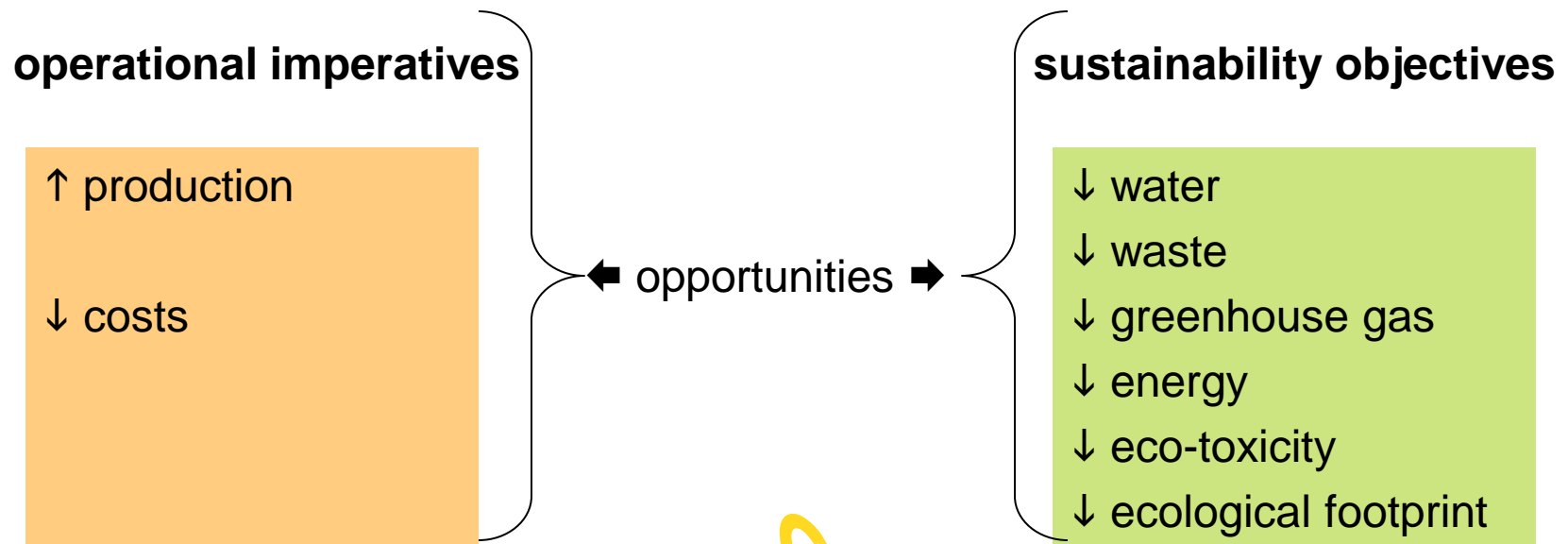
- > Biomass as a potentially **greenhouse gas neutral carbon source** for metallurgical processes.
- > **Zero Waste flow sheets**... challenging the assumptions that wastes are inevitable.
- > High Pressure Grinding Rolls (**HPGR**) **circuit design**... optimising the entire circuit, not just a unit operation.

# Sustainable Resource Processing

Research Focus



## Because the world is changing...



# Sustainable Development

When you are asked as an operator...

**“what are YOU doing about sustainable development?”**

your answer might include the approach outlined here...

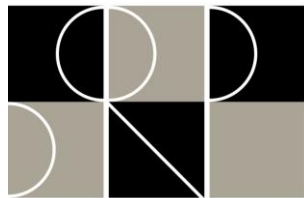
That is by:

- > taking a collaborative, multidisciplinary approach (& with your neighbour)
- > Learning from others (even though every situation, site & resource is different)
- > seeking improvements which are
  - incremental in existing operations
  - breakthroughs within the current paradigm
  - paradigm shifts
- > getting engaged in testing our ideas on your site

we can **work toward sustainable outcomes.**

## Centre for Sustainable Resource Processing

If your company has a need to improve its sustainable development and you have an interest in any of the following areas, please contact CSRP.



Centre for  
Sustainable  
Resource  
Processing

[www.csrp.com.au](http://www.csrp.com.au)

telephone 08 6436 8734

- > banana screens
- > ore preparation
- > regional synergies
- > geopolymers
- > Eco-Sand™
- > zero waste
- > biomass
- > sustainable resource processing

**Stevan Green**, Chief Executive Officer  
**Erica Smyth**, Independent Director