ReCon 2016
Reducing Reusing Recycling... Concrete

Session 1

# Myths and Truths around Concrete Recycling


*Presented by:*

Bryan Perrie

The Concrete Institute


CONCRETE SOCIETY OF SOUTHERN AFRICA

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# Facts

- Concrete is a durable material that is also recoverable
- Twice as much concrete as all other building materials
- Construction and demolition waste (C&DW)
  - Europe 510 million tons
  - US 325 million tons
  - Japan 77 million tonnes
  - China and India ???? Produce > 50% of world concrete

# Benefits

- Reduction of waste, landfill or dumping
- Reduction in natural resource exploitation
- Reduced transportation costs
- Good performance in some applications
- Employment opportunities
- Consumption of $CO_2$

| Country | %C&DW Recovery |
|---|---|
| Australia | 57 |
| Belgium | 86 |
| Czech Republic | 45 |
| England | 50 – 90 |
| France | 63 |
| Germany | 89 |
| Ireland | 80 |
| Japan | 80 |
| Netherlands | 95 |
| Norway | 50 – 70 |
| Spain | 10 |
| Switzerland | 100 |
| Taiwan | 91 |
| Japan | 82 |

# Economic benefits

- Anaheim – 700 000 t reused on freeway project: Saving US$ 5 million
- Western Link Melbourne – 15 000 $m^3$ concrete: Saving AU$ 4 million
- 41 US states recycle concrete pavements

# Recovery

- Reusing precast concrete elements
- Returned concrete at readymix plants
- Waste at precast yards
- Demolition waste

# Reuse

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# Demolition waste

- Challenges
  - Concrete mixed with other C&DW
    - Better to sort at site
    - Concrete pavements and structures best
  - Quality and history of original concrete

# Roads

- Most common use is in pavements
- Actively promoted by FHWA
- 41 states
- Can substitute most natural aggregate

- Note generally from concrete pavements and uncontaminated

# Roads

- Backfill
- Selected layers
- Draining subbases
- Stabilized layers
- Concrete pavements
- Asphalt
- Erosion control e.g. “rip-rap”

# Challenges

| Issue | Barriers |
|---|---|
| Material Cost | Low cost of virgin aggregates |
| Availability | Non-regular supply<br>Non-standard quality<br>Contamination |
| Processing | Controlled demolition<br>Site sorting<br>High-value recovery is expensive |
| Legal | Classification of waste increases permits<br>Need landfill tax or banning of C&DW |
| Environmental | Recovery and processing on site can be noisy and can pollute |
| Physical Properties | Limits on use depending on quality |
| Design requirements | Design for reuse and recycling |

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# A secondary materials economy in construction and demolition waste - opportunities and challenges in concrete

*Presented by:*


Kirsten Barnes

GreenCape


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GreenCape

# Using Site Derived Materials in Concrete

## A sustainable approach to conserving aggregates through the use of excavated sand, recycled bricks and recycled concrete

Presented by: Vernon Collis/ Kyle Wickins

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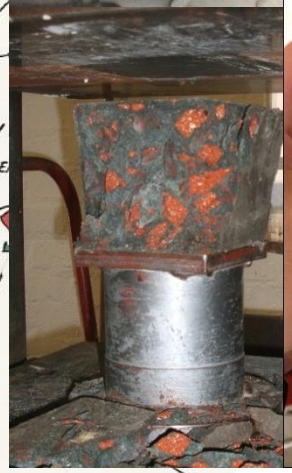
CoMSIRU

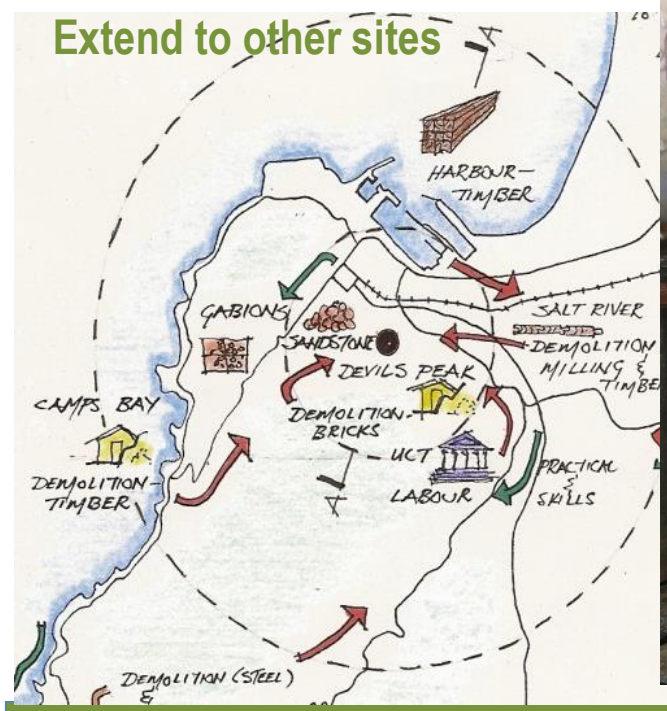
COLLIS and associates

## Site Auditing

## Materials Testing

## *"Materials First Design Second"*






3 Revised Design Process

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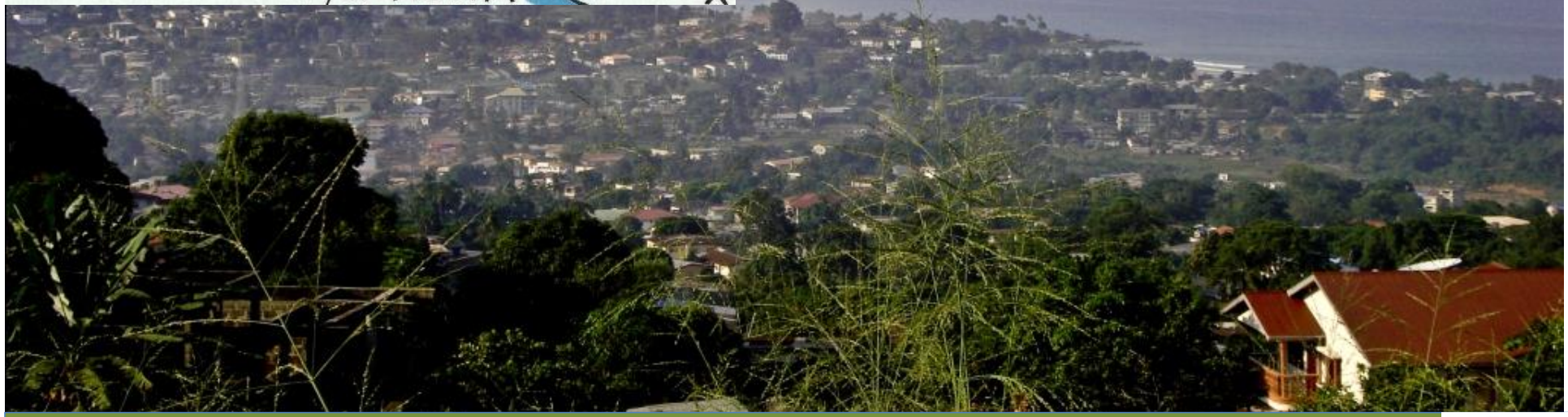

# Koidu Mine – Sierra Leone

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# 4 Project Context: Mining in Africa

Bubble Developments – prefab & import – 20 yr life

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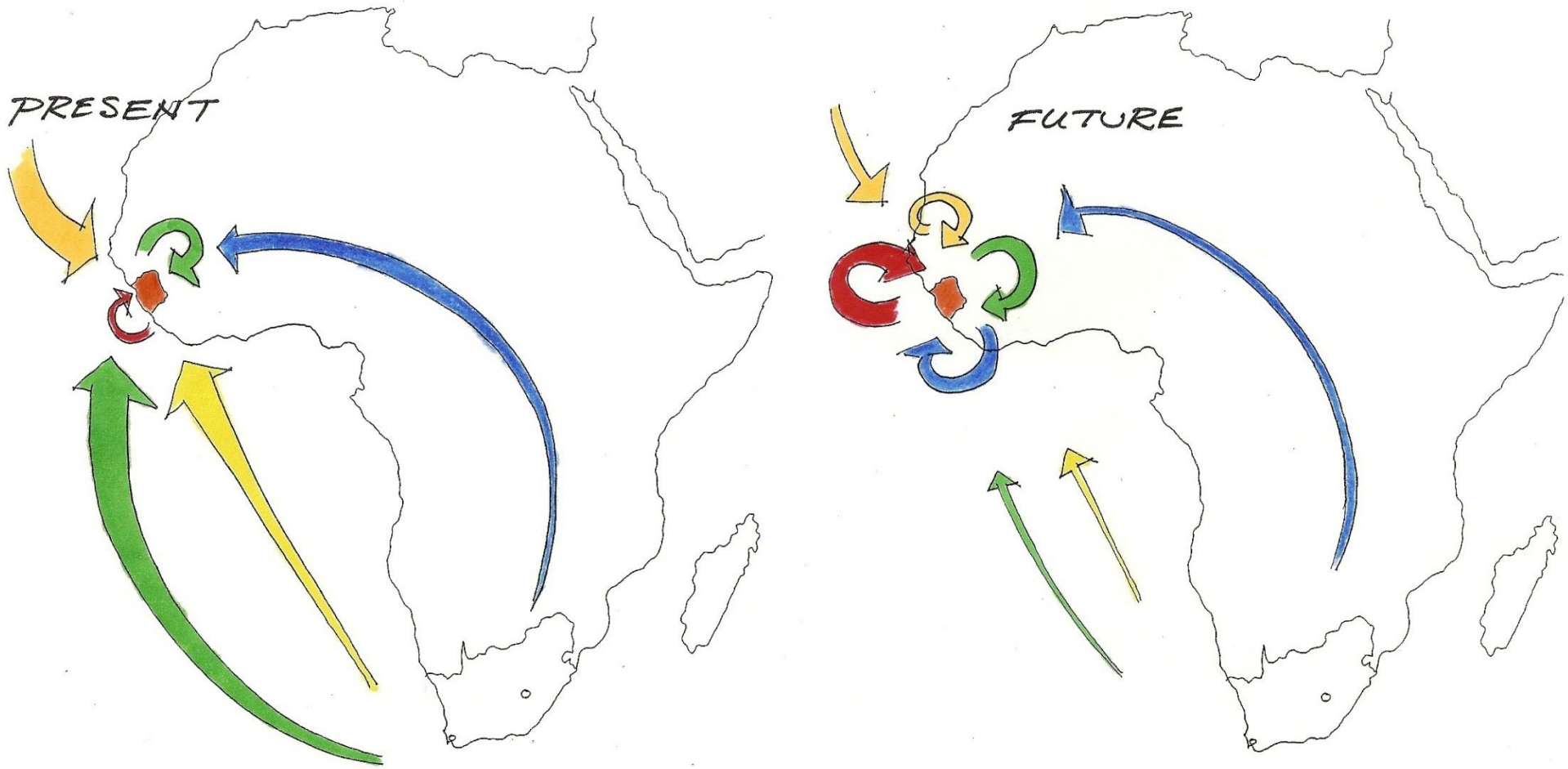
# INFRASTRUCTURE FOR MINESS

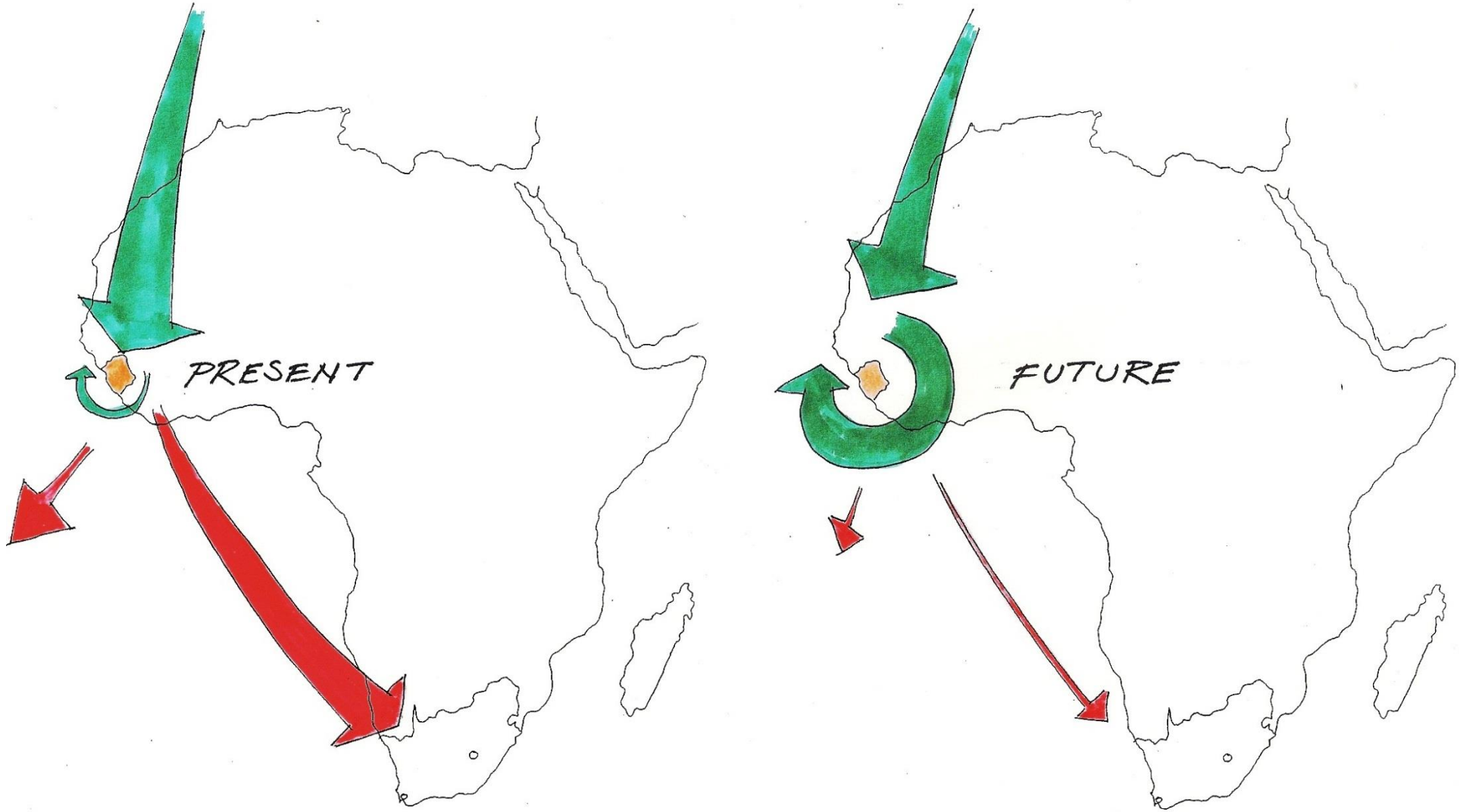
CONSTRUCTION TECHNOLOGY A LEVER FOR FURTHER SOCIAL, ECONOMIC & ENVIRONMENTAL GROWTH IN SIERRA LEONE




## RESOURCE FLOW MAP

- CONSTRUCTION MATERIALS
- PLANT & EQUIPMENT
- FUEL
- LABOUR
- EXPERTISE

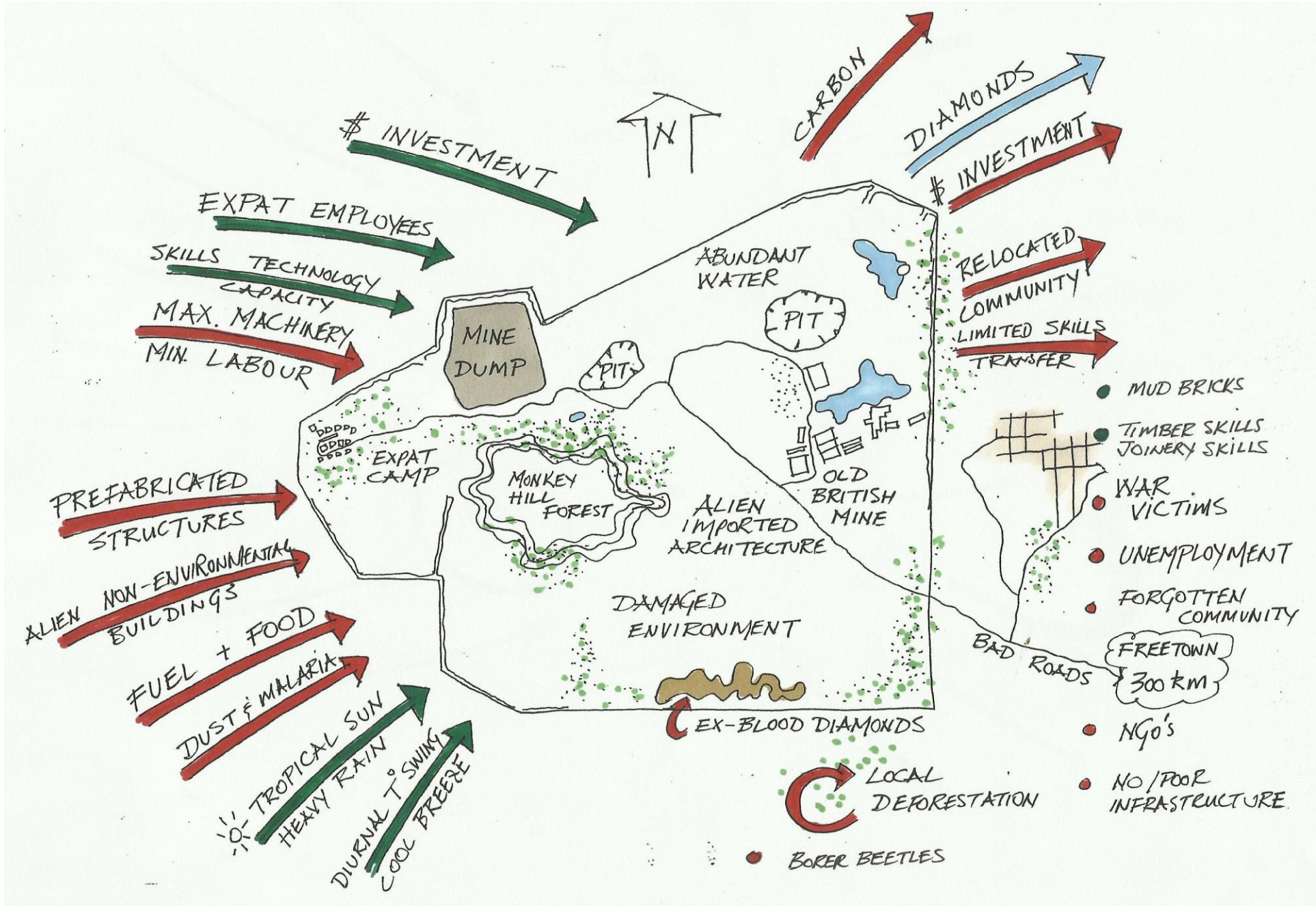
COLLIS & ASSOSIATES JULY '11

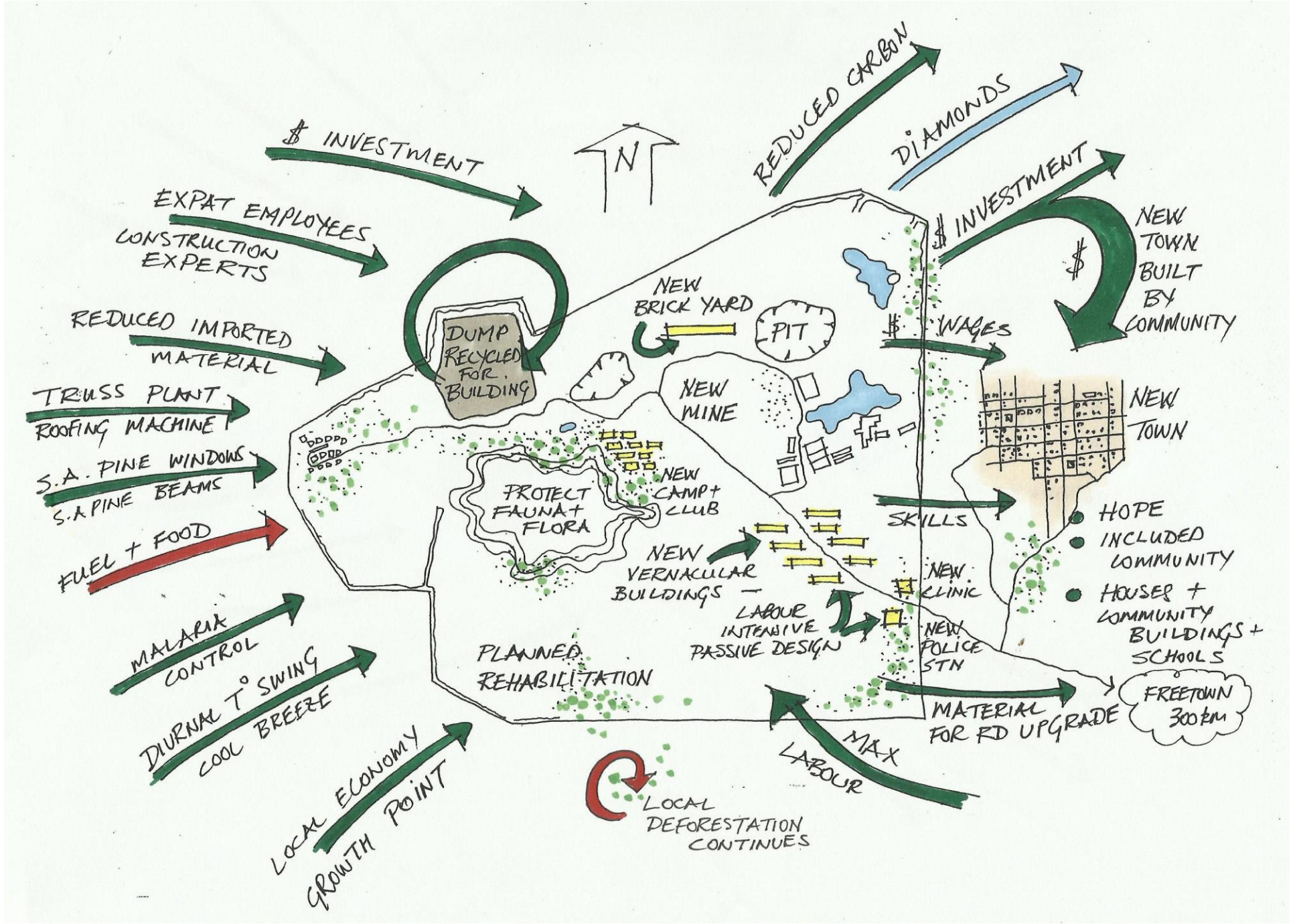



# MONEY FLOW MAP

## INFLUENCE OF KOIDU HOLDINGS ON SIERRA LEONE ECONOMY

COLLIS & ASSOCIATES JULY '11


$ INVESTMENT
EXPAT EMPLOYEES
SKILLS TECHNOLOGY CAPACITY
MAX. MACHINERY
MIN. LABOUR
PREFABRICATED STRUCTURES
ALIEN NON-ENVIRONMENTAL BUILDINGS
FUEL + FOOD
DUST & MALARIA
TROPICAL SUN
HEAVY RAIN
DIURNAL T° SWING
COOL BREEZE
N
CARBON
DIAMONDS
$ INVESTMENT
RELOCATED COMMUNITY
LIMITED SKILLS TRANSFER
MINE DUMP
PIT
PIT
ABUNDANT WATER
EXPAT CAMP
MONKEY HILL FOREST
ALIEN IMPORTED ARCHITECTURE
OLD BRITISH MINE
DAMAGED ENVIRONMENT
EX-BLOOD DIAMONDS
LOCAL DEFORESTATION
BORER BEETLES
MUD BRICKS
TIMBER SKILLS
JOINERY SKILLS
WAR VICTIMS
UNEMPLOYMENT
FORGOTTEN COMMUNITY
BAD ROADS
FREETOWN 300 km
NGO's
NO/POOR INFRASTRUCTURE


$ INVESTMENT
N
REDUCED CARBON
DIAMONDS
EXPAT EMPLOYEES
CONSTRUCTION EXPERTS
$ INVESTMENT
NEW TOWN BUILT BY COMMUNITY
REDUCED IMPORTED MATERIAL
DUMP RECYCLED FOR BUILDING
NEW BRICK YARD
PIT
WAGES
TRUSS PLANT
ROOFING MACHINE
NEW MINE
NEW TOWN
S.A. PINE WINDOWS
S.A PINE BEAMS
PROTECT FAUNA + FLORA
NEW CAMP + CLUB
SKILLS
HOPE
INCLUDED COMMUNITY
FUEL + FOOD
NEW VERNACULAR BUILDINGS
NEW KLINIC
HOUSES + COMMUNITY BUILDINGS + SCHOOLS
LABOUR INTENSIVE PASSIVE DESIGN
NEW POLICE STN
MALARIA CONTROL
PLANNED REHABILITATION
DIURNAL T° SWING
COOL BREEZE
FREETOWN 300 km
MATERIAL FOR RD UPGRADE
MAX LABOUR
LOCAL ECONOMY GROWTH POINT
LOCAL DEFORESTATION CONTINUES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Session 5

# Manufacturing quality green, environmentally friendly concrete products- a case study


*Presented by:*

Anthony Gracie

Cape Brick


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CAPE BRICK Est. 1938
BUILDING A BETTER ENVIRONMENT WITH RECYCLED MATERIALS

# An historical perspective

- In 2000 we started the first crushing and re-use of our own waste
- In 2001 we ran out of waste and then partnered with Ross Demolition to import demolition material
- Up until present we have used almost 1 million tons of RCA
- We can process around 400 tons per day and sometimes use up to 500 tons per day in the manufacturing process

# The challenges with externally sourced RCA

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- The make up of the material
- Varying materials
- Contamination
- Cost versus benefit
- Constant availability
- Material size
- Space to store material when available
- Local authority issues (waste licenses etc)

CAPE BRICK Est. 1938
BUILDING A BETTER ENVIRONMENT
WITH RECYCLED MATERIALS

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# Sustainable Concrete
## Experience in Europe

*Presented by:*

Mark Tomlinson

LafargeHolcim

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OF SOUTHERN AFRICA

LafargeHolcim

Recyclable materials are produced in every major city on the planet.

# "Valuable Resource NOT "Waste Management"

>3 Billion Tonnes of construction & demolition materials are generated every year worldwide

>40 Billion Tonnes of aggregates consumed every year

Construction & demolition materials often disposed in Landfill OR used in low value applications

The increasing demand for sustainable solutions means we must understand the real value of these resources

We have an opportunity to provide higher value and preserve natural resources but there are a number of challenges

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# Recycling concrete into concrete
## "obtaining the highest value"

UPCYCLING

Concrete

Road

General

Value

DOWNCYCLING

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# Recybéton Project

## FRENCH NATIONAL RESEARCH & DEVELOPMENT PROJECT

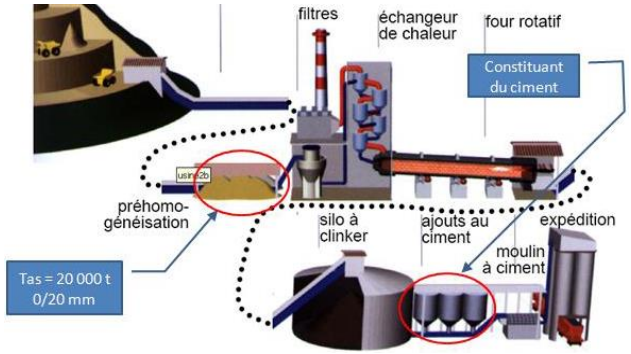
- This National Project federates 48 French partners around its program :
  - Building and public works companies
  - Construction recycling companies
  - Aggregates producers
  - Cement companies
  - Ready mixed and precast concrete producers
  - Professional federations and organizations from the construction sector
  - Technical centers and laboratories from public institutions and the private sector
  - Public and semipublic contractors and agencies acting as Project Manager
  - Construction insurance companies association
  - Universities and Engineering Schools

RECYBETON

# Objectives

- 1- To reuse all the materials obtained from demolished concrete, even the fines, as components of new concretes

- 2- To recycle the fine grain size part of demolished concrete as raw material for the manufacture of cements (either to produce clinker or as an addition into a blended cement)



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# HISER Project

- Holistic Innovative Solutions for an Efficient Recycling and Recovery of Valuable Raw Materials from Complex Construction and Demolition Waste (HISER) project is co-financed in the framework of the biggest EU Research and Innovation Programme - Horizon 2020.

- HISER project is an answer to European challenges that have been identified in the construction and demolition sector such as:

- the need to move towards highly efficient paradigms of recovery of valuable raw materials in priority waste streams within the EU28,
- the need for progress in novel recycling technologies for complex Construction and Demolition Waste,
- the need for novel solutions stimulating selective sorting at source of materials arising from demolition and refurbishment works

Hiser

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# Recycling in the Readymix Industry

*Presented by:*


Johan van Wyk

SARMA


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# Recycling on a Readymix Concrete plant

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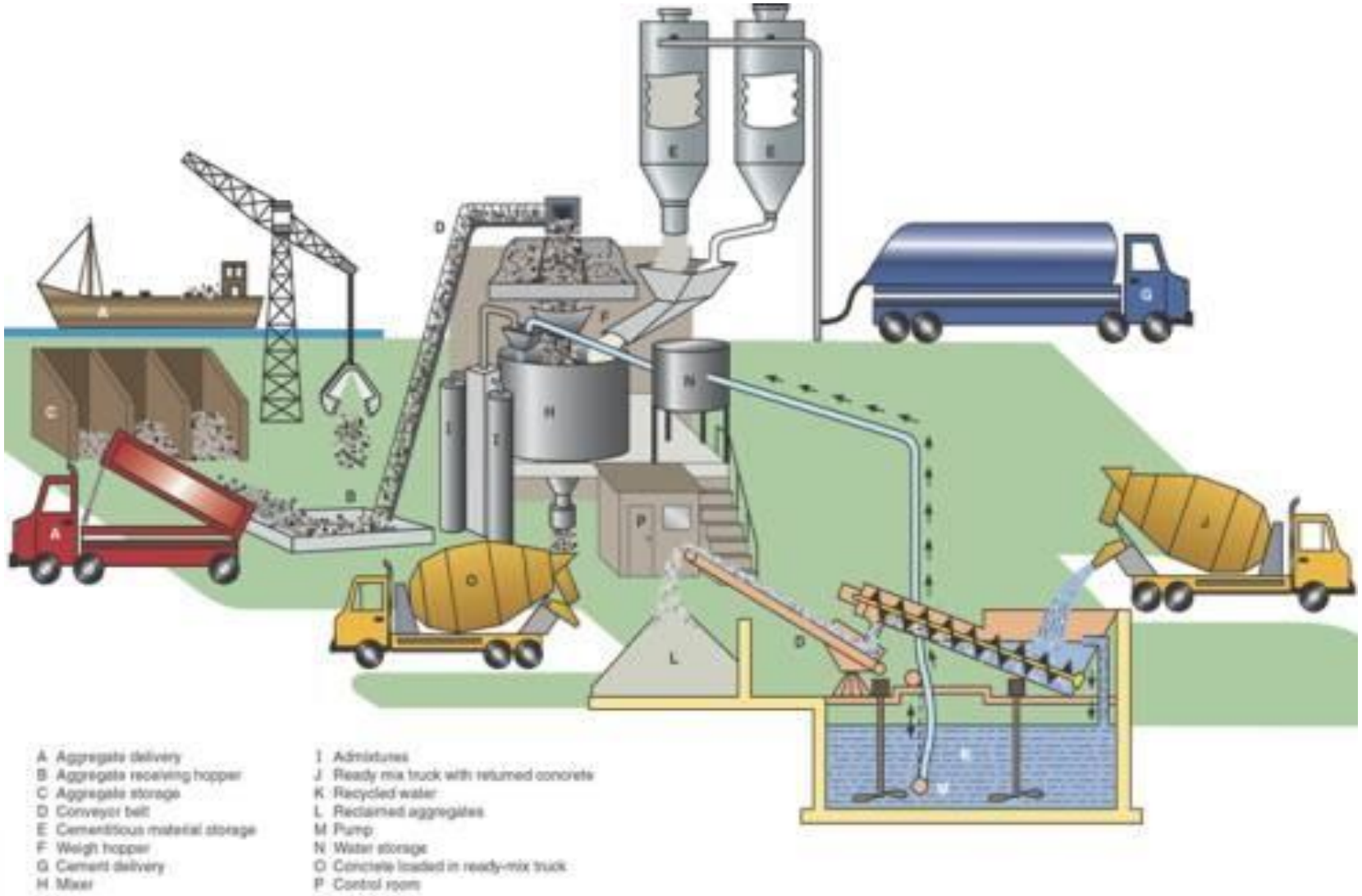


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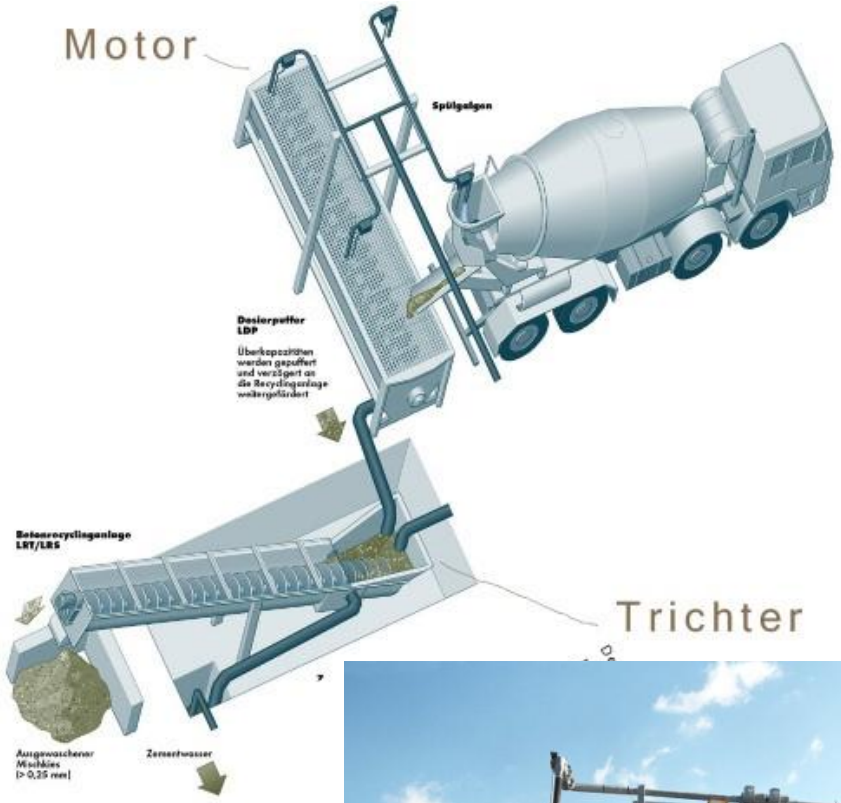
# Recycled fresh conc

Moulding

Paving

Redirecting

Recovering aggregates

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# Demolition & Recycling

*Presented by:*


Shane Clark

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# Demolition & Recycling

## Contents:

- Demolition – Overview
- Properties / Techniques
- Explosive
- Chemical
- Mechanical
- Hydro
- Diamond Cutting
- Recycling
- Logistics
- Projects

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# Explosion Fail

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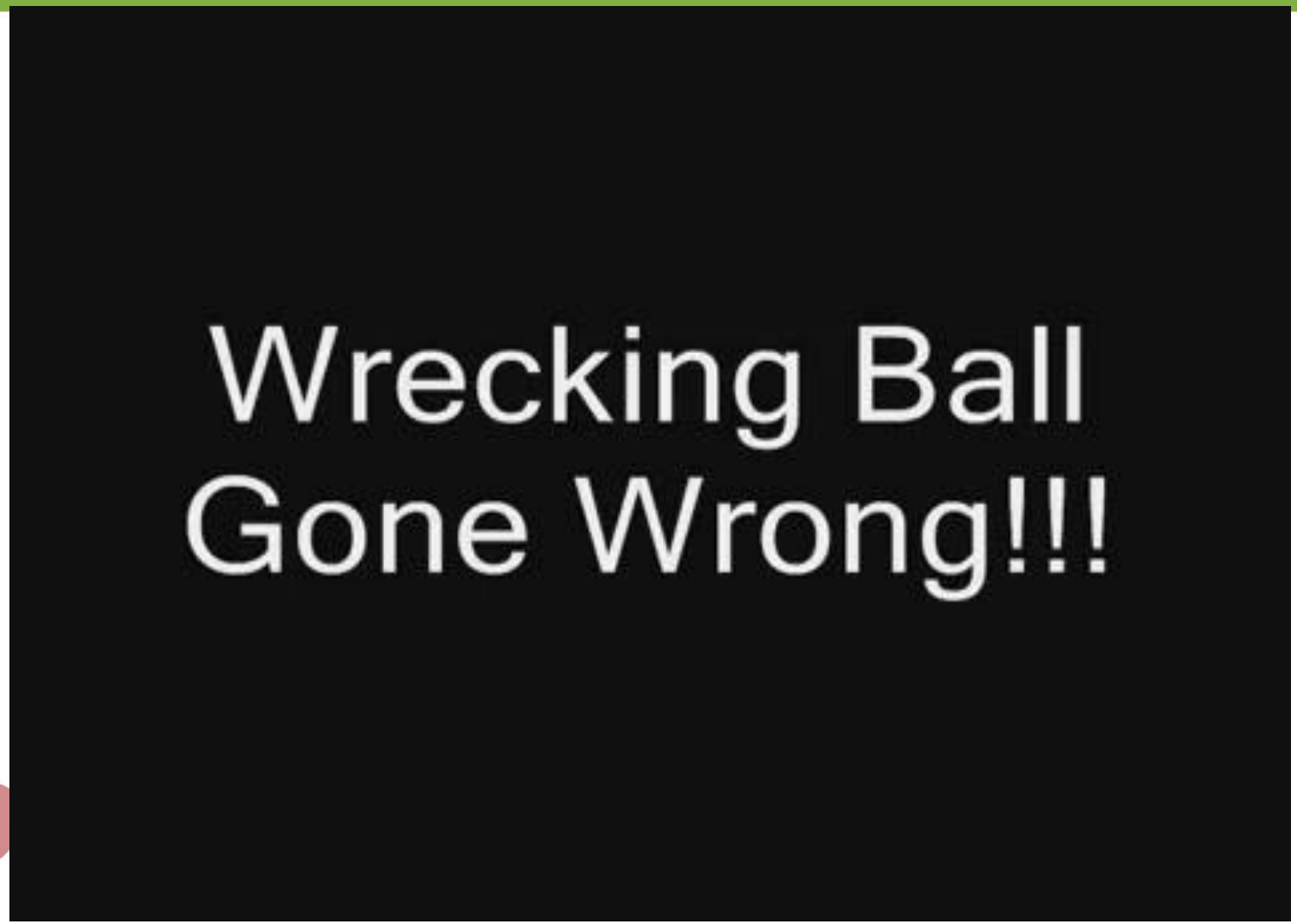
# Wrecking ball gone wrong

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# Dream Machine