

5th International Workshop - Advances in Cleaner Production

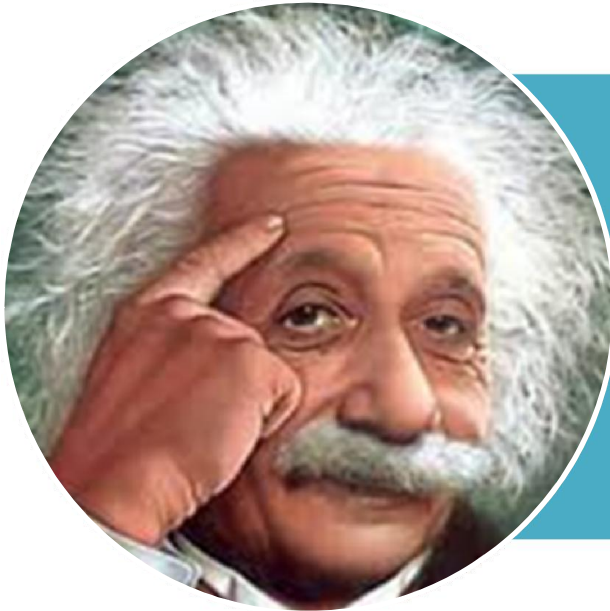
São Paulo - Brazil - 20th to 22nd, May - 2015



A Lean & Green Model for a Value Stream

Academic Work

The role of sustainability



Sustainability has become a legacy for the 21st century.

It embodies the promise of evolution towards a more equitable world in which the natural environment is preserved for generations to come.

This project (**this paper, L&G Model for a Cell and my PhD**) intent is to promote the encounter of two different ways of thinking, lean thinking and green thinking.

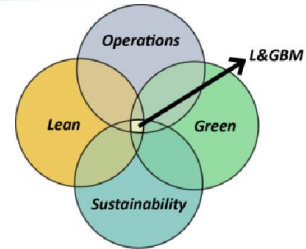


A Lean & Green Model for a Value Stream

- This paper presents part of the content studied in my PhD;
- It proposes an extension of the **Lean & Green Model for the 2nd level of flow** published by Journal of Cleaner Production end of last year (Pampanelli et al., 2014) understanding its main characteristics and differences.
- The model is rooted in 4 main literature blocks: Operations Managements, Lean Thinking, Sustainability, Environmental Practices.
- Studies developed confirmed that traditional VS thinking (divided by product families) is not applicable for solving with environmental problems in a manufacturing environment.
- Following this finding, the L&GBM for second level flow was developed and tested in a single multi-national engineering company, including the results of the model application at the value stream level.
- Such findings confirm that the Lean & Green Model can reduce resources use in a VS level and save money (more than R\$ 1,5Mi).



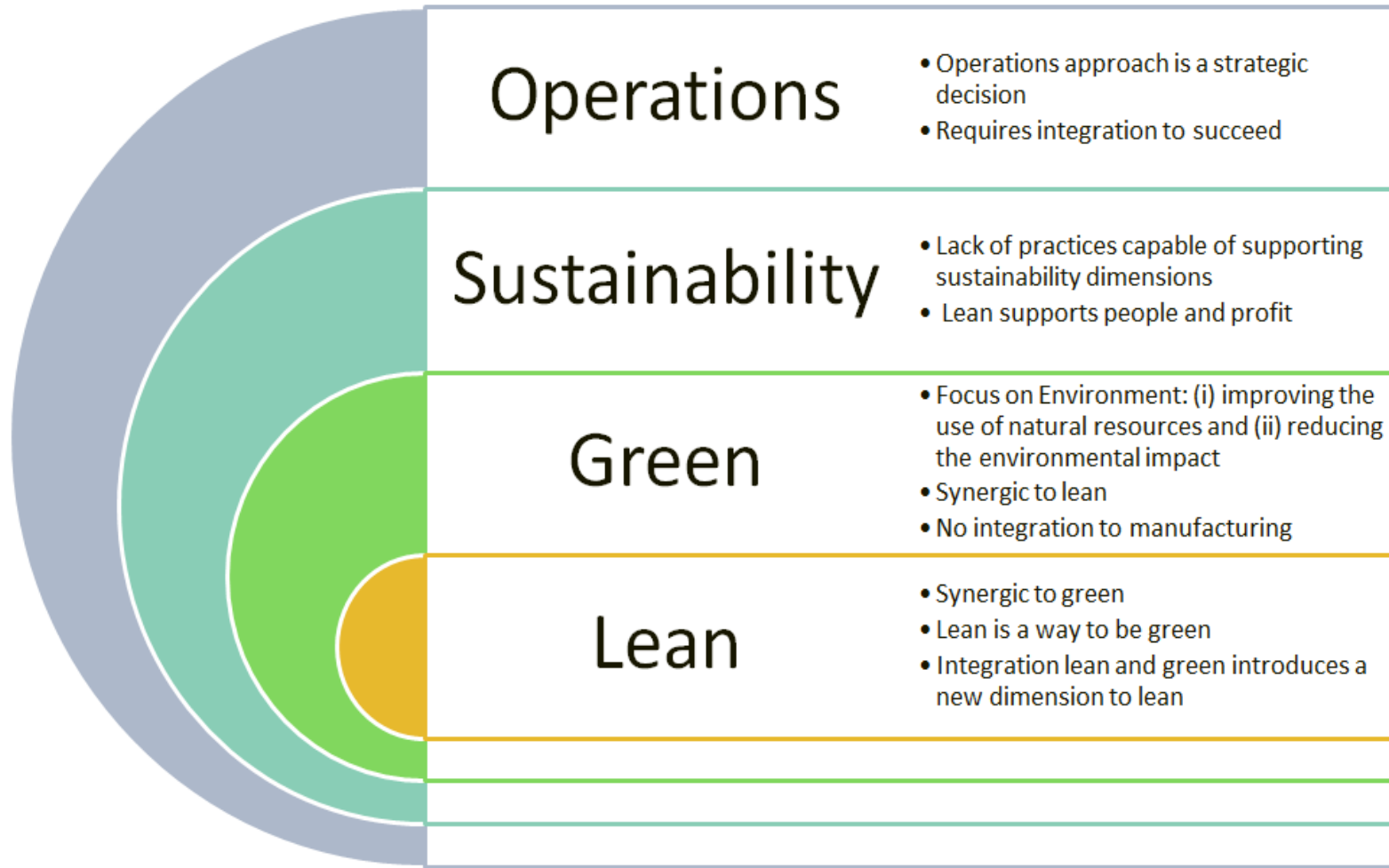
Research inputs from literature



| | Operations Management | Lean Thinking | Sustainability | Compression | Green Thinking |
|------------|---|---|--|--|---|
| Purpose | Support, implement and drive business strategy. | "Producing exactly what the customer wants, exactly when (with no delay), at fair price and minimum waste." | "Meets the needs of the present without compromising the ability of future generations to meet their own needs." | "Assure survival of life and promote quality of life using processes that work to perfection with self-correcting, self-learning systems. No use of excess resources. No wasted energy. No toxic releases. Quality over quantity, always." | "Use of natural resources without going beyond the carrying capacities and the production of pollutants without passing the biodegradation limits of the receiving system." |
| Dimensions | (1) Quality (2) Delivery (3) Cost | (1) Safety (2) Quality (3) Delivery (4) Cost | (1) Social (2) Economic (3) Environment | (1) Social (2) Economic (3) Environment (4) Quality | (1) Environment |



Literature Analysis



L&GBM: The purpose

- Lean can be described in **four dimensions** (S-Safety, Q-Quality, D-Delivery and C-Cost):
“Producing exactly what the customer wants, exactly when at fair price and minimum waste” (BICHENO, 2000)
- Environmental thinking can be described in **one dimension** (E-Environment), with two main focus:
“(1) Producing with the maximum productivity in the use of natural resources and with the (2) minimum environmental impact”
- The L&GBM will be **adding one more dimension to lean thinking** – E-Environment



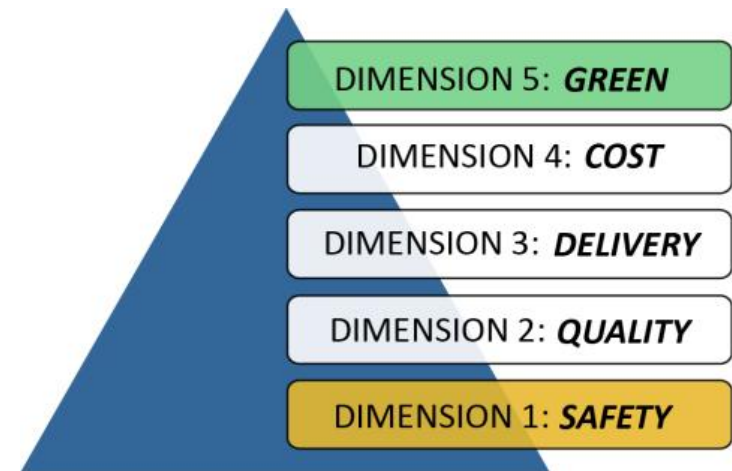
L&GBM: The purpose

- **The L&GBM purpose:**

“Producing exactly what the customer wants, exactly when (with no delay), at fair price and minimum waste and environmental impact and the maximum productivity in the use of natural resources”

S+Q+D+C+E

*Process stability + Environment →
Cost reduction*



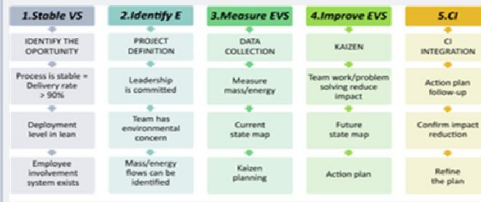
Cascading L&GBM General Model

Improving manufacturing processes resources productivity by optimizing its supporting flows performance.

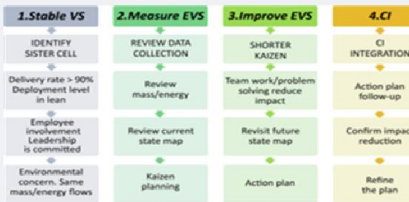
General Model



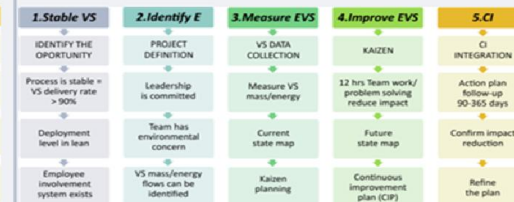
Cell – 1st



Sisters – 1st



VS – 2nd

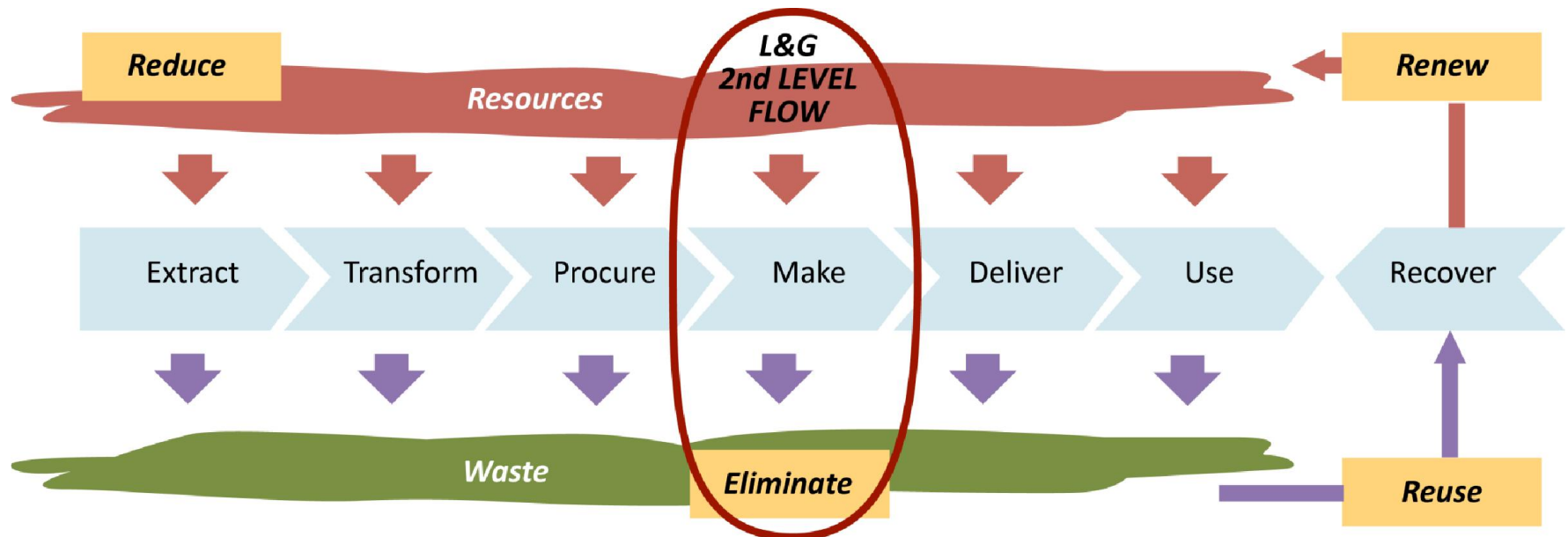


Boundaries

1. stable process (90%)
2. Deployment in Lean
3. EI in place
4. Leadership
5. Environmental awareness
6. Use of natural resources
7. Data collection



L&GBM for a Value Stream



The issue - VS x Environmental Impact

Lean

Value Stream focus

Oriented to product Families

Focused on costumer demand

Green

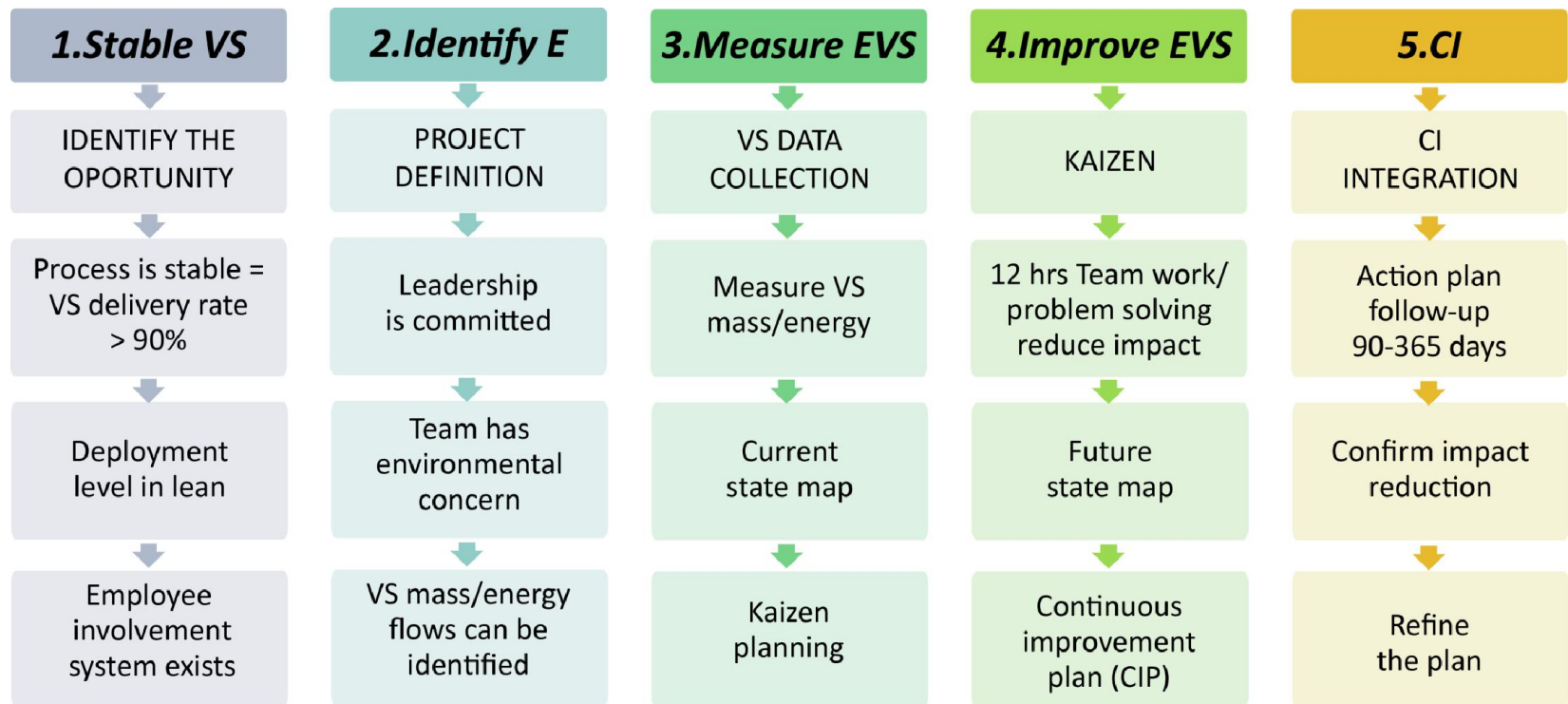
Site and its surroundings impacts
(air, soil, groundwater, flora, fauna)

Global environmental impact
Rate of using energy and raw materials
Rate for waste environmental assimilation

The environment is the end customer



The Model – L&GBM for a Value Stream



Kaizen – L&GBM for a Value Stream

Day 1

1. Scope Doc
2. Actual State Map
3. Understanding Environmental Impacts
4. Understanding mass & energy flows costs

Day 2

1. Validating environmental impacts
2. Shop floor environmental review

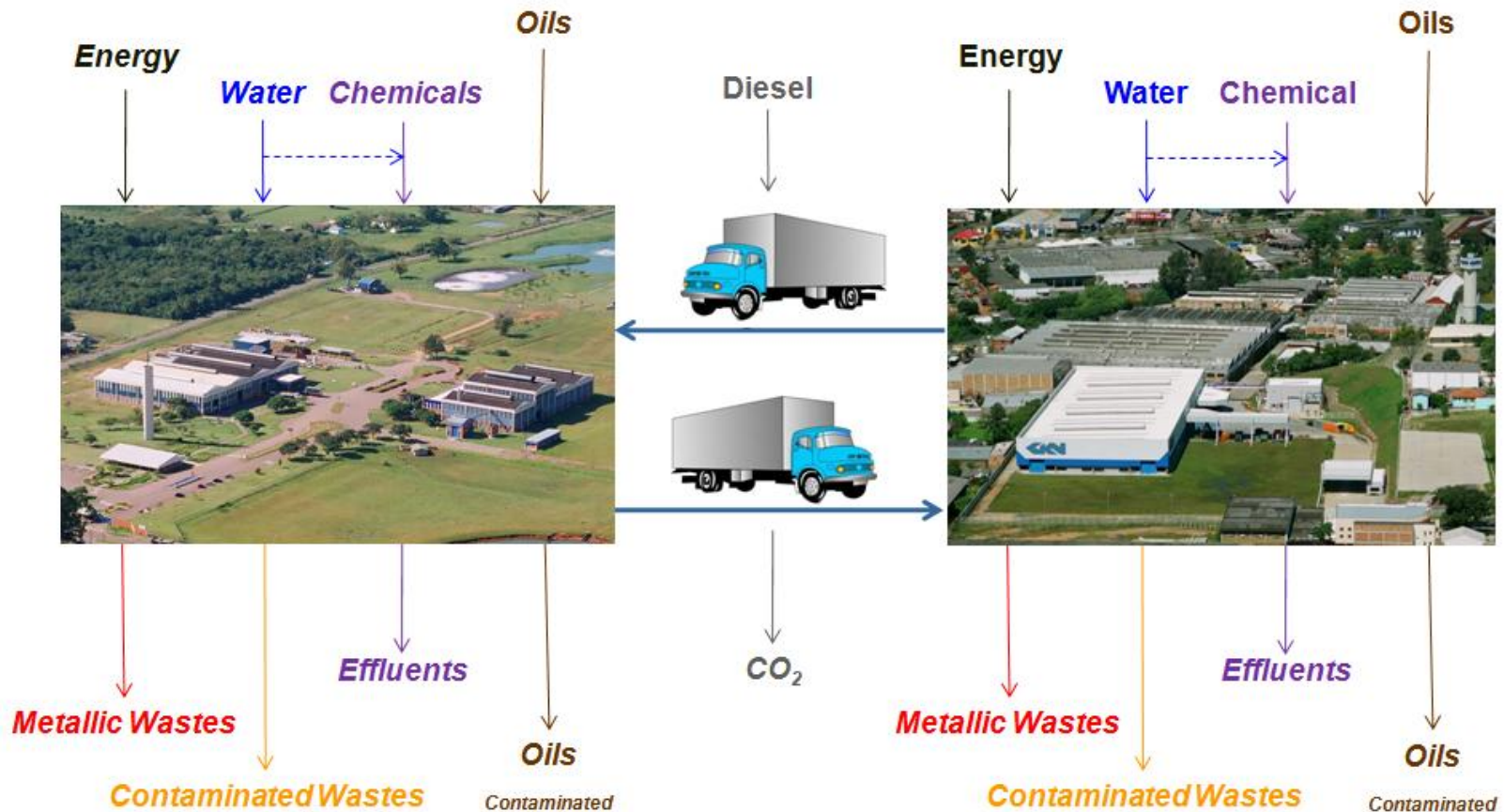
Day 3

1. Lean & Green Matrix
2. Future State Map
3. Action Plan



SCOPE for mass and energy analysis – CHQ & POA

Lean and Green Model for a value stream
SCOPE for mass and energy analysis - CHQ and POA sites



* Activities excluded: Heat Treatment and Painting



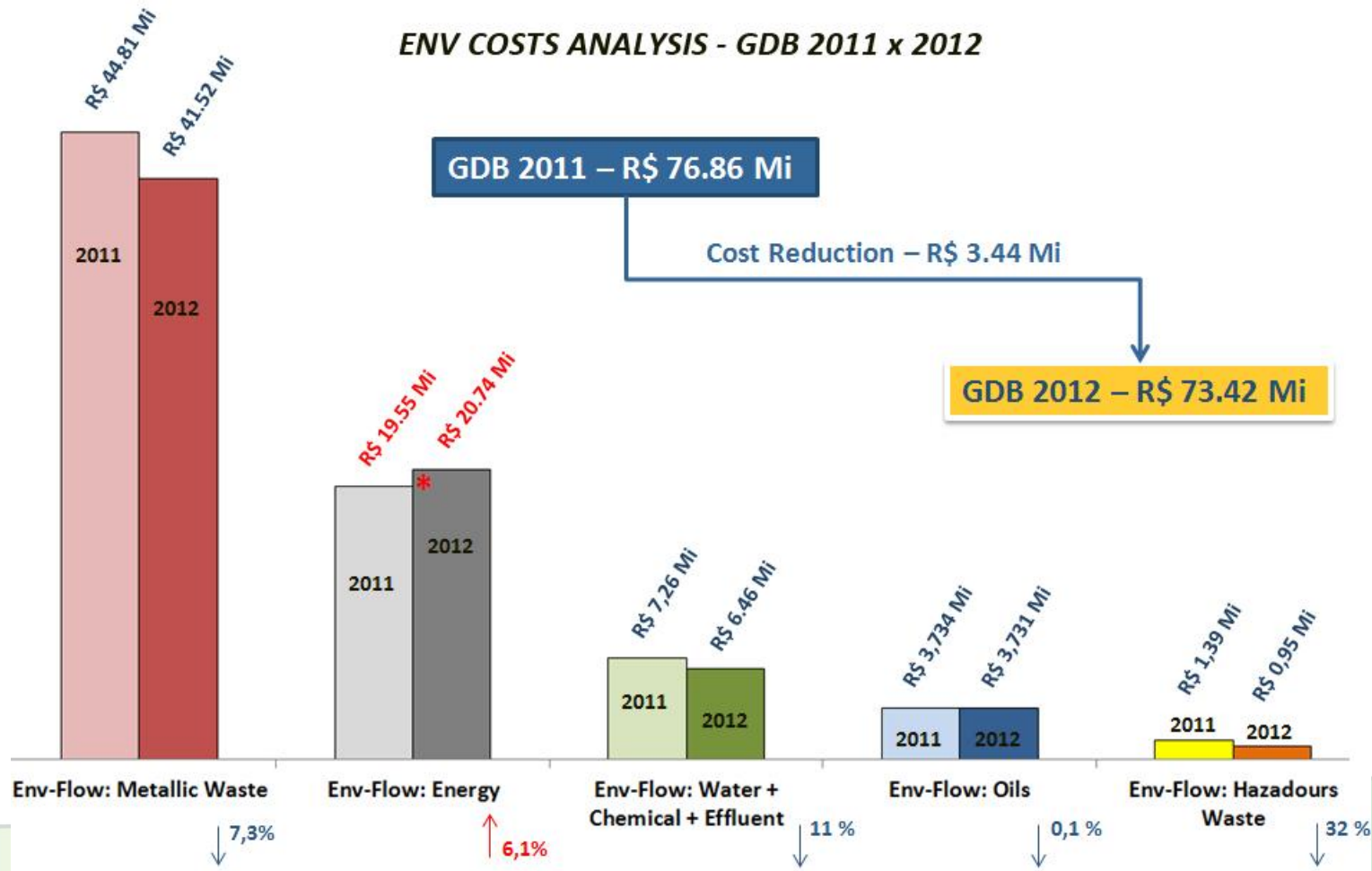
Application of L&GBM for a VS

| Lean & Green Kaizen - Prerequisites | | |
|--|-----------------------------------|-----------------------------------|
| YEAR | 2011 | 2012 |
| Dates of the Kaizens: | 22/Nov/2011 | 29/Nov/2012 |
| Sales in the period: | 6.200.000 SEH | 6.400.000 SEH |
| Annual tones of shipped parts: | 57.197 Ton | 59.038 Ton |
| Average Delivery rating (DAS): | 92% | 94% |
| Level of Lean: | Deployment + | Deployment + |
| Application of Employee Involvement Tools: | Deployment + | Deployment + |
| Cell/Site ISO 14001 Certification: | Since 2000 - 4 ^o Cycle | Since 2000 - 4 ^o Cycle |
| Data of the latest environmental training received by the site Team Members: | jul/11 | jun/12 |
| Site has an intensity use of resources? | YES | YES |
| Main supporting e-flows are cost intensive? | YES | YES |
| Data collection structure? | YES | YES |



Results of L&GBM for a VS

ENV COSTS ANALYSIS - GDB 2011 x 2012



Results of the L&GBM for VS

L&GBM for a VS confirmed all the objectives

**(1)
Confirmation of
the 7
prerequisites**

**(2) 1.6Mi in
direct savings
(21% action
plan
implemented)**

**(3) Several
environmental
improvements**

**(4) Integration
to existing CI
structure – ISO
14001**

**(5) VSM
thinking (divide
by product
families) is not
applicable**



What is next ?

L&GBM for a Cell in other places

Apply **L&GBM for a cell in other manufacturing businesses**

(other GKN businesses and also outside GKN)

that possess a good deployment level of lean.

L&GBM for a VS in other places

Apply **L&GBM for a VS in other manufacturing businesses**

(other GKN business and also outside GKN)

to identify potential benefits in terms of environmental impact and cost reduction.

L&GBM for extended VS

Apply **L&GBM for 3rd level flow**

(extended value stream)

in GKN Driveline Brazil.



Thank you !

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