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# **TOWARDS SUSTAINABLE MAINTENANCE MANAGEMENT OF RURAL UNPAVED ROADS**

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# Introduction

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- Local roads and natural resource access roads represent a large proportion of the Canadian road network (90 %)
- Unpaved roads are often used for longer than their expected useful lifetime. These older roads cause significant maintenance costs and require expensive repairs.



# Introduction

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- In order to deal with this reality, the maintenance of unpaved road networks is more complex and requires strategic planning based on clear and determined objectives.
- In the past few years, the treatment of unpaved roads with stabilization agents or dust suppressants have been widely studied (*Departement of Army (1995), Jones et coll. (2008), Monlux et Mitchell (2007 et 2006) et Skorseth et Selim (2000)*).



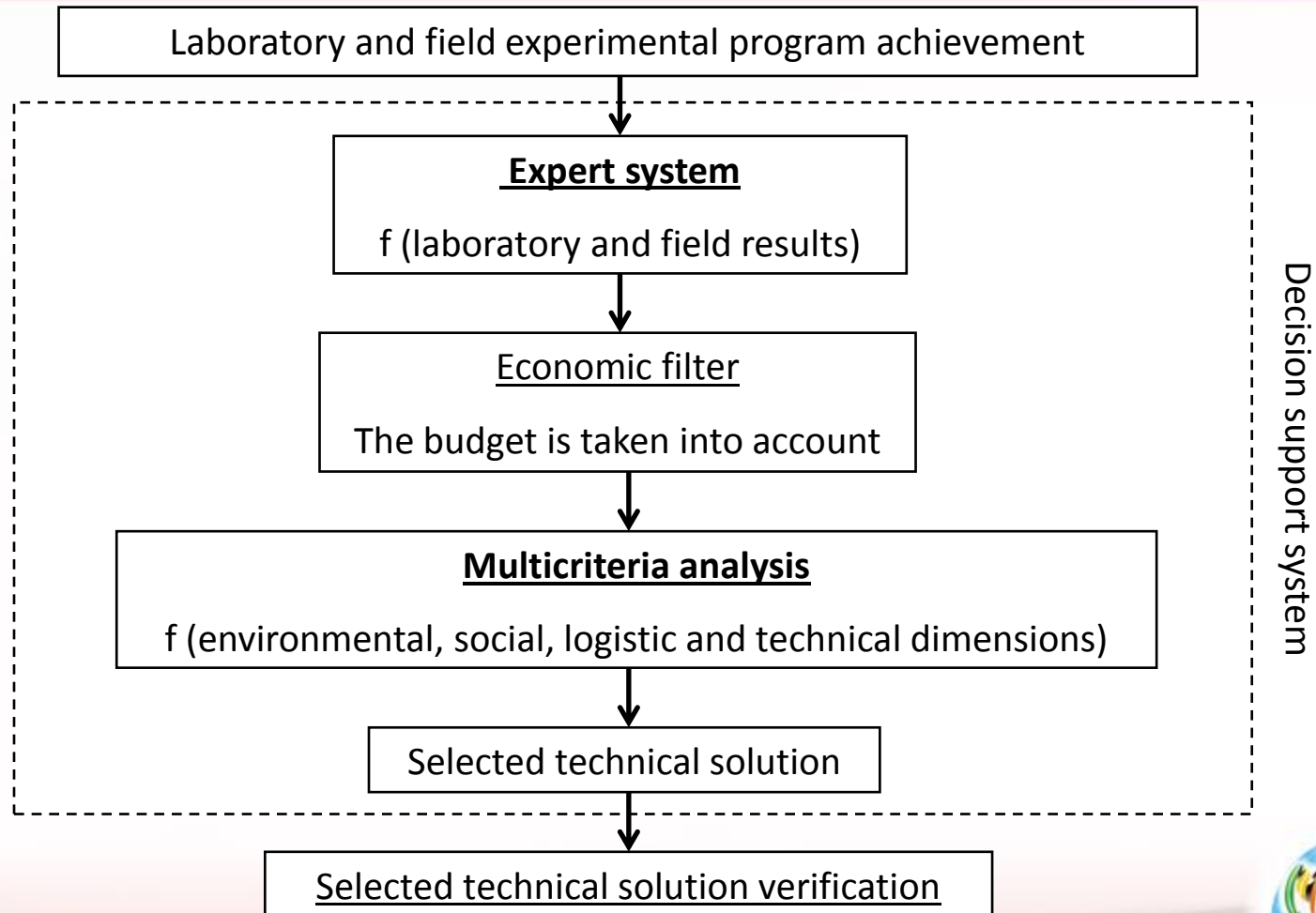
# Objective

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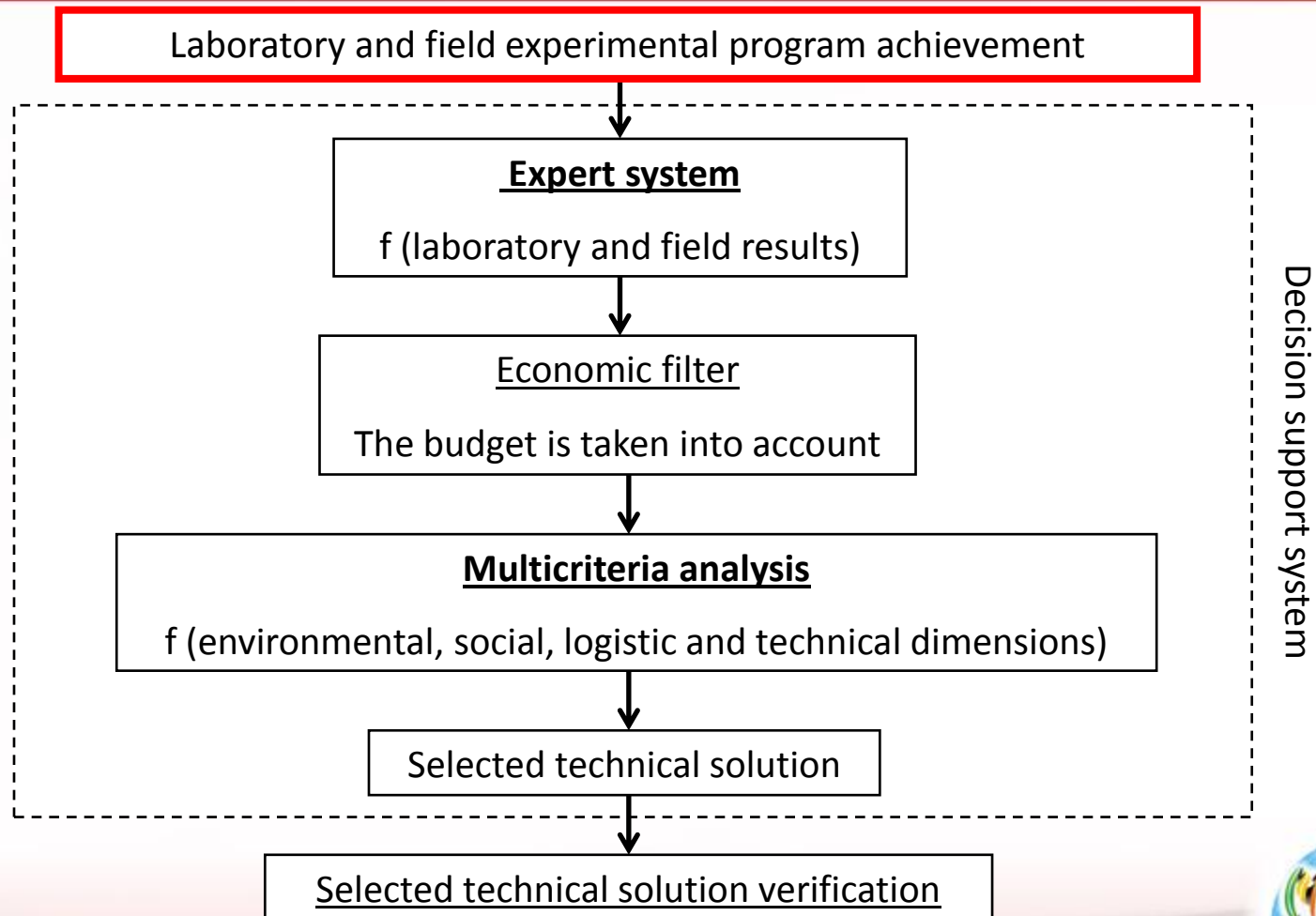
The aim of this project is to develop a decision support system to maintain an unpaved road network according to the road context and the road network managers needs and priorities.



# Decision support system



# Decision support system



# Laboratory and field experimental program achievement

## Laboratory experimental program

Granitic gneiss, Basalt, Limestone X 3 gradings

2 stabilization agents and 2 dust suppressants X 3 application rates per product

Compressive strength

Bearing capacity

Resilient modulus

Direct shear





# Laboratory and field experimental program achievement

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## Field experimental program

### *Summer 2007*

- 3 road sections of 200 m at Montmorency forest
- Hygroscopic and synthetic products
- Environmental and mechanical performance tests were performed

### *Summer 2008*

- 6 road sections of 200 m at Montmorency forest
- 7 road sections of 500 m at La Tuque
- Hygroscopic, organic and synthetic products
- Environmental and mechanical performance tests were performed

### *Summer 2009*

- 4 road sections of 500 m at La Tuque
- Hygroscopic and synthetic products
- Environmental and mechanical performance tests were performed

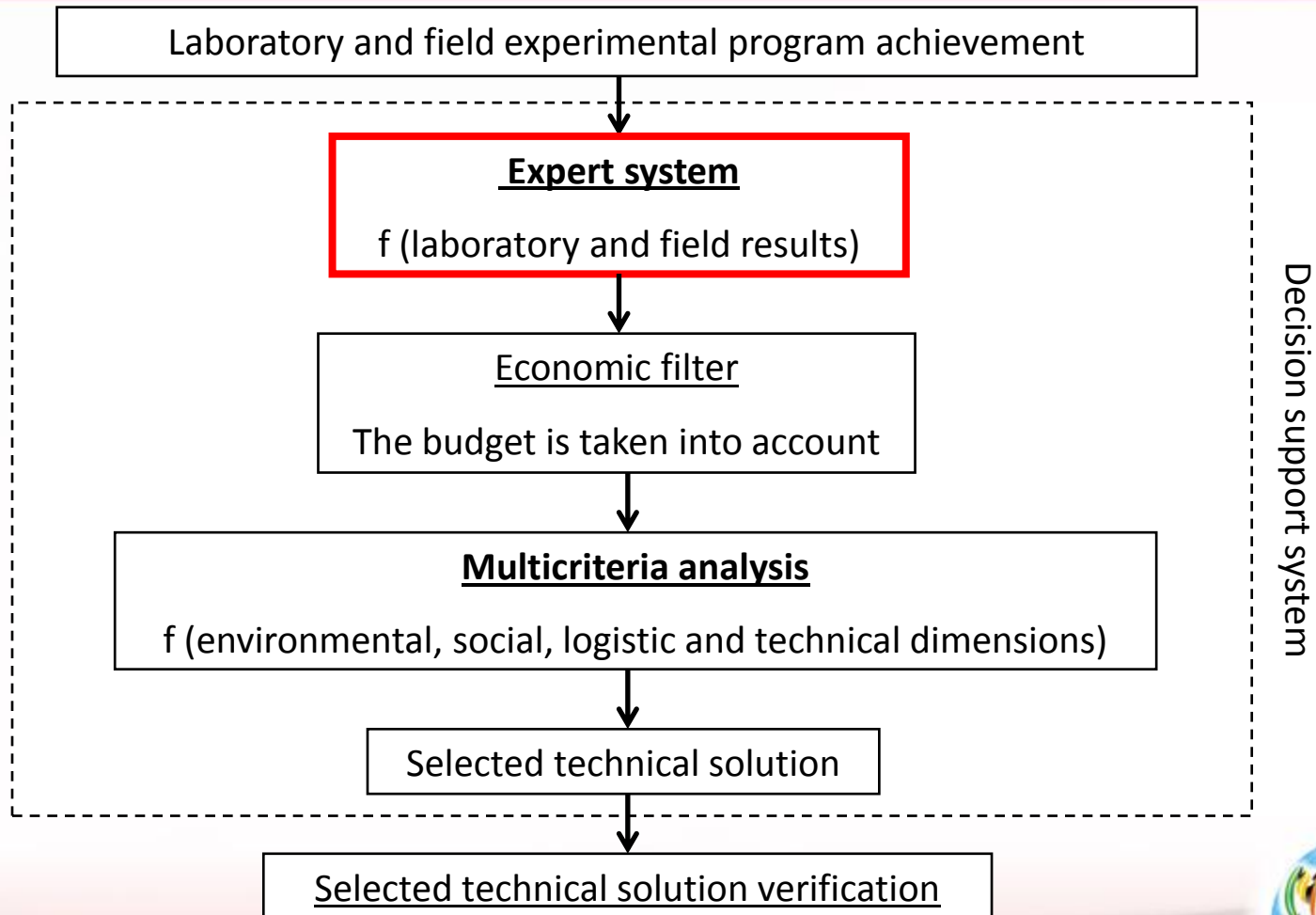
### *Summer 2010*

- 6 road sections of 200 m at Bromont
- Hygroscopic products
- Mechanical performance tests were performed





# Decision support system



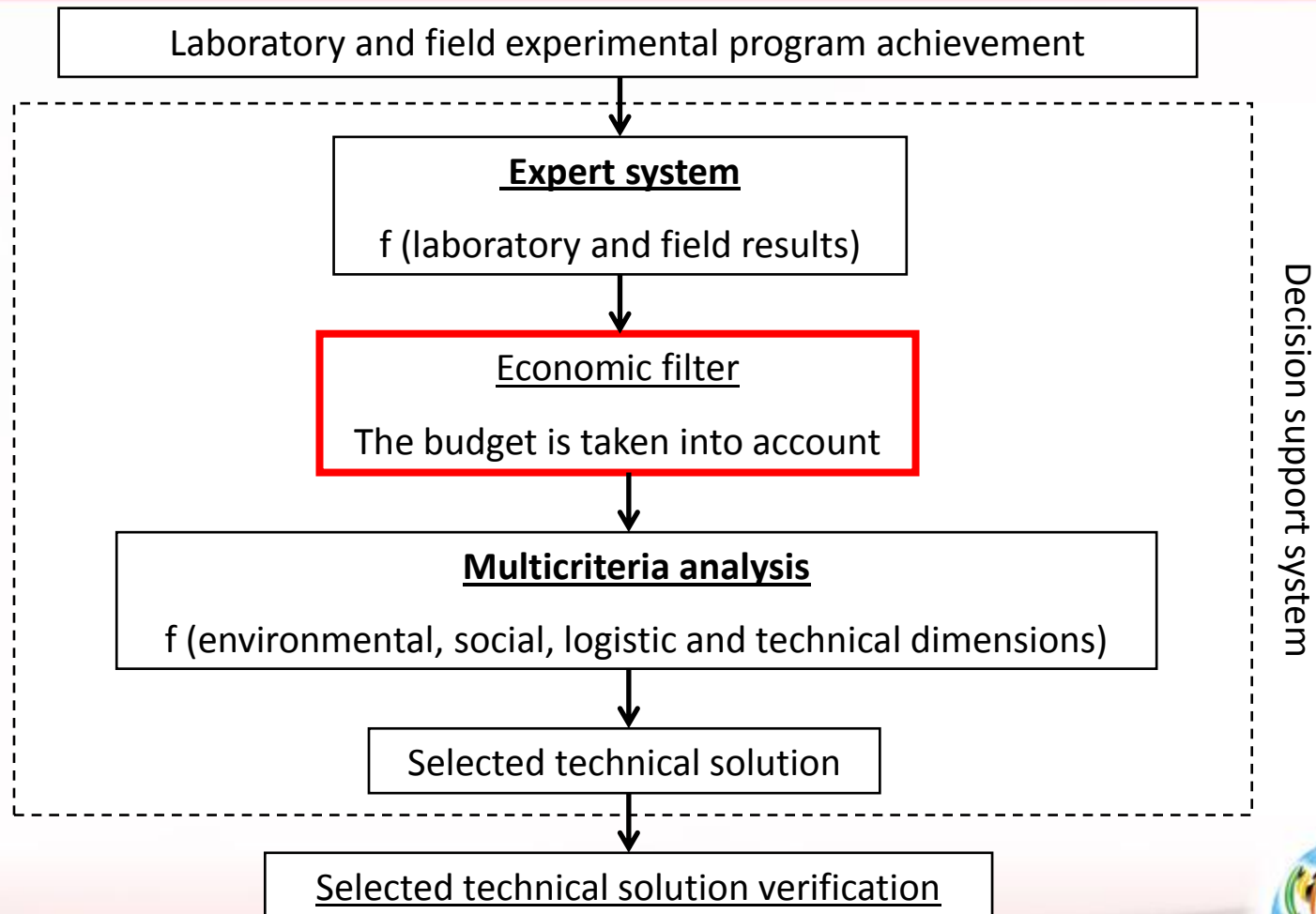
# Expert system

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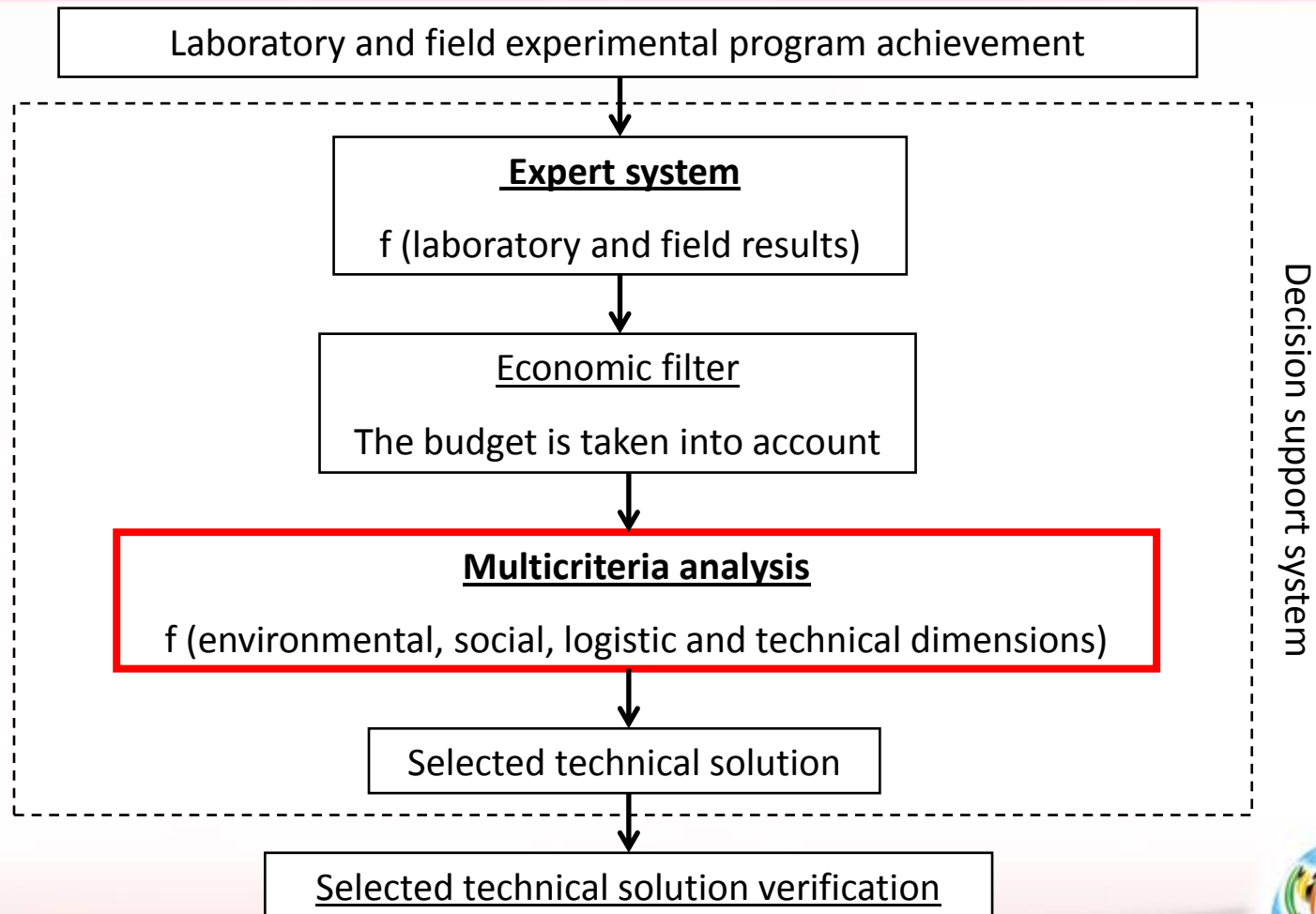
- The influence of mineralogy and grading on the performance of granular materials stabilized or treated with dust suppressants has been established (*Beaulieu et coll. (2010)*) in order to provide combinations of products and concentrations that promote maximum road quality in a specific context.
  - Mineralogy (granitic gneiss, basalt, limestone)
  - Grading
  - Climate
  - Type of vehicle travelling



# Decision support system



# Decision support system



# Multicriteria analysis

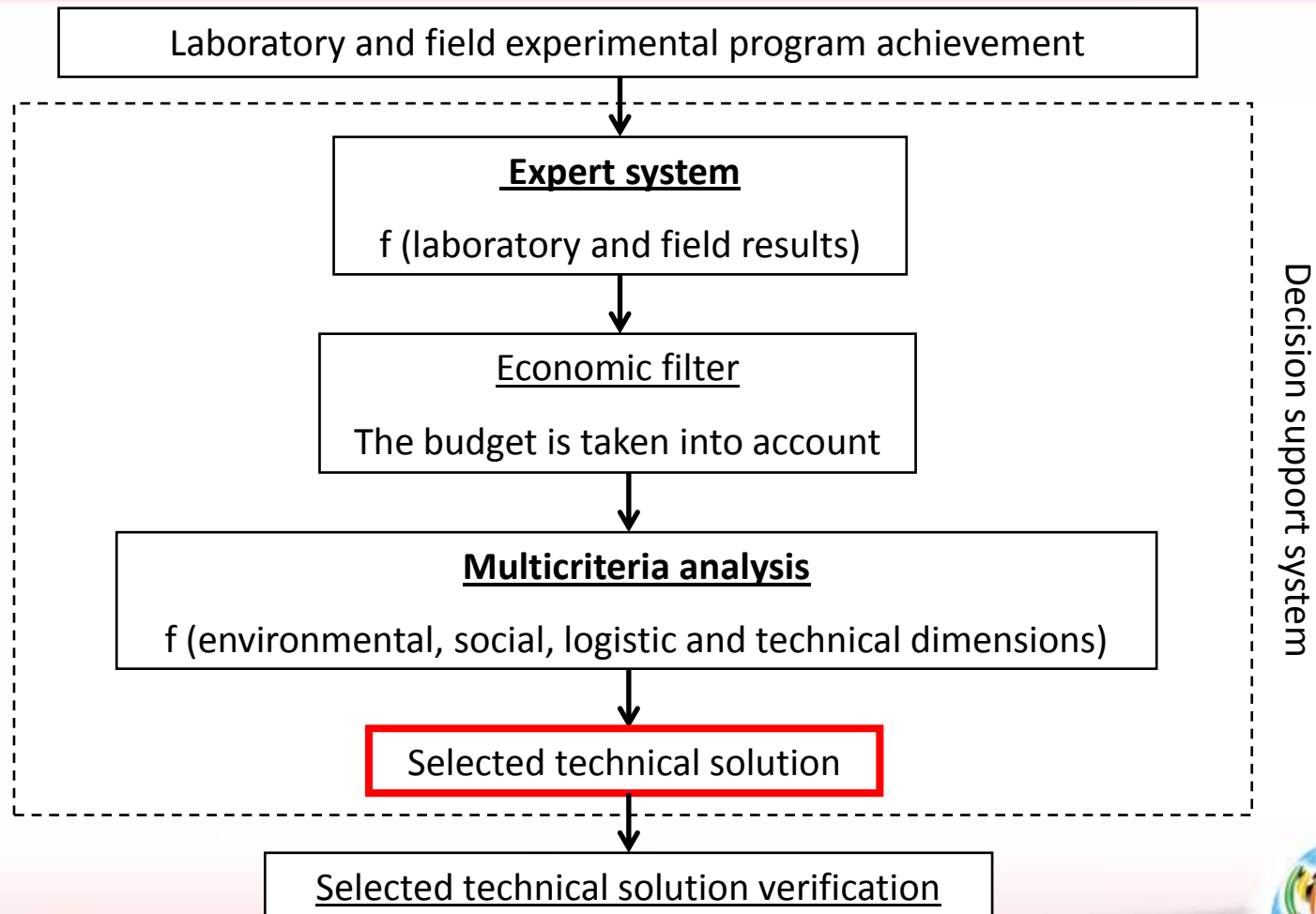
- The proposed solutions for the maintenance of an unpaved road network will essentially depend on the needs and priorities of the road network manager that are linked to environmental, social, logistical and technical dimensions

## Dimensions

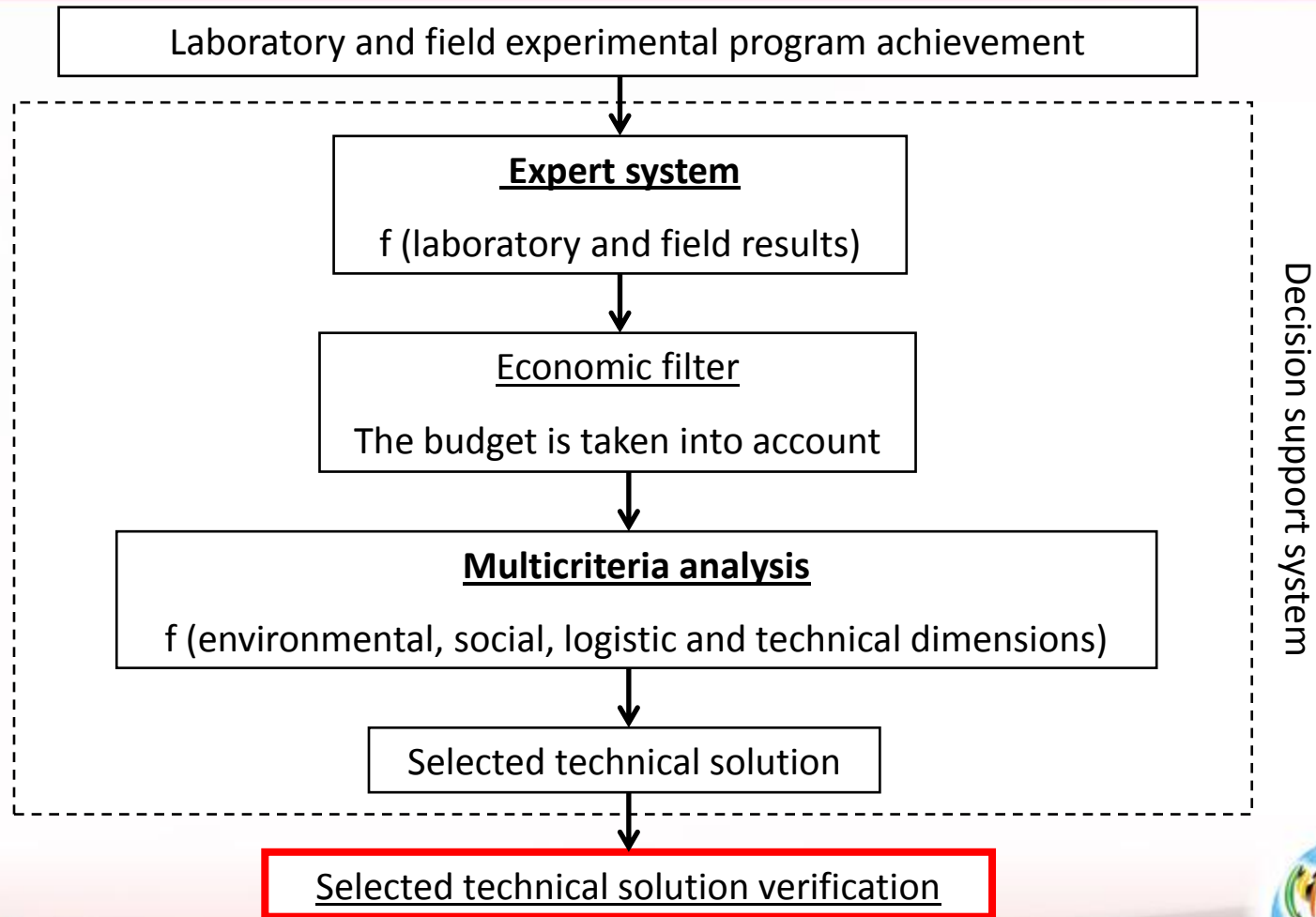
<u>Environmental</u>	<u>Social</u>	<u>Logistical</u>	<u>Technical</u>
<ul style="list-style-type: none"><li>•Air quality</li><li>•Water quality</li></ul>	<ul style="list-style-type: none"><li>•Influence on surrounding populations</li><li>•Influence on accidents</li></ul>	<ul style="list-style-type: none"><li>•Influence on road transport<ul style="list-style-type: none"><li>•Influence on road properties and services</li><li>•Road practicability</li></ul></li></ul>	<ul style="list-style-type: none"><li>•Road life<ul style="list-style-type: none"><li>•Bearing capacity</li><li>•Road surface quality</li></ul></li><li>•Maintenance frequency</li></ul>



# Decision support system



# Decision support system





# Conclusion

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- The decision support system shown in this paper should help to provide practical solutions (stabilization or dust control) for effective maintenance of unpaved rural roads depending on the road context and the network manager needs and priorities.
- The decision support system may evolve and it will be possible to incorporate new products.
- The decision support system will be available online in english or french.



Thank you for your attention!

