SCIENCE*SPRING*DAY

Department of Mathematics

Operations Research

Centro de Matemática e Aplicações
/ Linha de Investigação Operacional

CMaFCT.UNL
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LNEG

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Degree on **Mathematics – Operations Research (FCT – UNL)**
Master on **Operations Research and Systems Engineering (IST-UTL)**
PhD on **Engineering and Industrial Management (IST-UTL)**

Objectives

Closed-loop supply chains and reverse logistics: model developement accounting for several real world features: multiproduct, multiperiod, capacities, acquisition, production and storage decisions. **Stochasticity**: uncertainty issues related with returns quantity and quality, demand quantity, transportation costs. Development of **supply chain resilience** metrics. **Sustainability**: within supply chain design and planning, and vehicle routing problems; modeling of environmental impacts; metrics development for social sustainability. **Vehicle routing problem**: model development for the multiproduct, multidepot waste collection networks. **Dial-a-ride problem**: vehicle routes optimization to door-to-door transportation problem.

Methodology

Mathematical programming linear modeling: development of MILP models for different problems.
Optimization using **CPLEX solver** developed by IBM – ILOG with **GAMS** interface.
Environmental impact assessment: ECO-Indicator 99 and RECIPE.
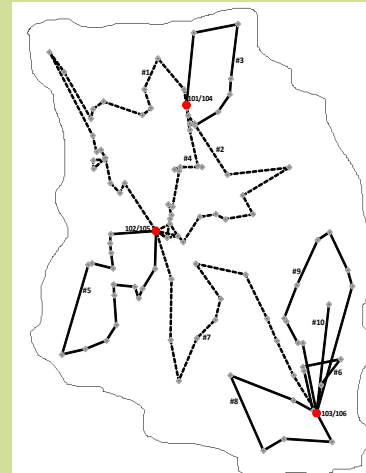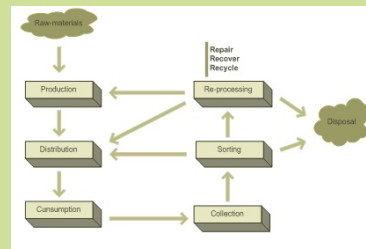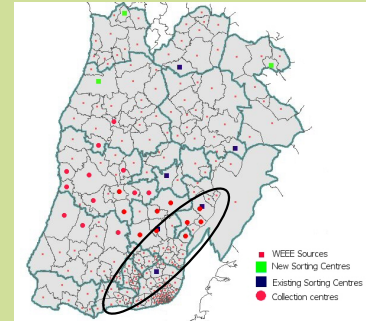
Expected Results

Different case studies have been addressed: **AMB3E** WEEE recovery network design; **VALNOR** and **AMBILITAL** waste collection routing optimization; **JERÓNIMO MARTINS** and **AUTOSIL** warehouse location and network retrofit; **ZON** service network costs assessment and design.

- Zeballos, Luis J., M. Isabel Gomes, Ana P. Barbosa-Povoa, and Augusto Q. Novais. **"Addressing the uncertain quality and quantity of returns in closed-loop supply chains**." Computers & Chemical Engineering 47 (2012): 237-247.
- Salema, M. Isabel Gomes, Ana P. Barbosa-povoa, and Augusto Q. Novais. **"An optimization model for the design of a capacitated multi-product reverse logistics network with uncertainty**." European Journal of Operational Research 179 (2007): 1063-1077.