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Author: Mr. Ruben Elvira
EADS CASA Military Air Systems, Spain, ruben.elvira@eads.com

Prof. Daniel Gallego
Universidad Politécnica de Madrid, Spain, gallegocuadrado@terra.es

# MODELING AND OPTIMIZING SPACE SUSTAINABLE DEVELOPMENT

**Abstract**

The main purpose is modeling and optimizing sustainable growth of space community in order to guarantee its future development with minimun impact in the environment (social, economic and environmental goals) that surrounded it. Going from imagination of CSR principles and theory to real metrics and its implementation by quantitative analysis. A new substantive programmatic approach in CSR understanding pursuing a global maximum avoiding local ones.

Space sector is a key strategic area in mankind development that every government and company all around the world must support. For that reason sustainable principles are even more important in space sector rather than other ones, although in these industries sustainablity is "*cutting edge*" and is more studied than in space one.

It is proposed a set of tools to model, analyze, optimize and check the sustainability of a space project during its lifecycle, such as Goal Programming, Project Sustainable Profile, Risk Analysis, using a PDCA methodology.

**PLAN**

- Identify key project variables
- Define KPIs por those variables (%)
- Identify dedicated resorces levelling
- Identify risks

**DO**

- Model the project (Function Z to maximize, constraints...)
- Solve the model (Goal Programing, Multigoal Optimization)
- Establish the Sustainable Baseline in the Project Sustainable Profile and correspondent lower limit
- Evaluate and quantify risks (Balance variables in Z function)

**CHECK**

- Monitor all variables and risks periodically through each corresponden KPI
- Update Project Sustainable Profile

**ACT**

- Update level of resources needed to reach foreseen sustainability (increase/decrease)in case any variable is outside sustainability tolerances

The sustainability function is defined as following: Max Z = {X economics, X social, X environment}, where Z is the Sustainable Project Index, and X the variables considered for the project. Those variables are balanced by coefficients coming from risk analysis, prioritizing the more critical ones by forcing a higher level, it means, more dedicated resources. Also a set of constratins, which represent the level of the resources dedicated, must be modeled.

As a result, it is obtained metrics and trends to pursue in accordance with the resources dedicated, and a global sustainbility index (Z value) to clasify and prioritize projects. Trying to support the more sustainable projects, or if it is necessary to support a project due to strategic reasons, provide the necessary resources to reach a minimum sustainable level.

The two major milestones reach with this work are:

- Kick-off point considering sustainability as a decision parameter in space project evaluation and prioritization
- Triggering the standardization of space sustainable principles and best practices