

BIO PACIFIC RIM SUMMIT 2014, San Diego (CA) - Dec. 7 - 9

BIO-MAN: a site-specific, feedstock procurement project to switch from a fossil to a multi-purpose green refinery, in a circular economy perspective

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Requirements for a new Biorefinery (Italian Decree on Biorefineries, 2013)

- To indicate the agricultural and forestry biomass sources available, both at present time and in perspective, for the procurement plan
- To indicate energy consumption and CO₂ emissions for their production, harvesting/collection, transport and storage
- To use traced biomass sources, produced or collected according to sustainable agricultural practices
- To progressively increase from 20 to 60% the percentage of biomass supply in the radius <70 km from the biorefinery, in the 3-5 yrs after start-up

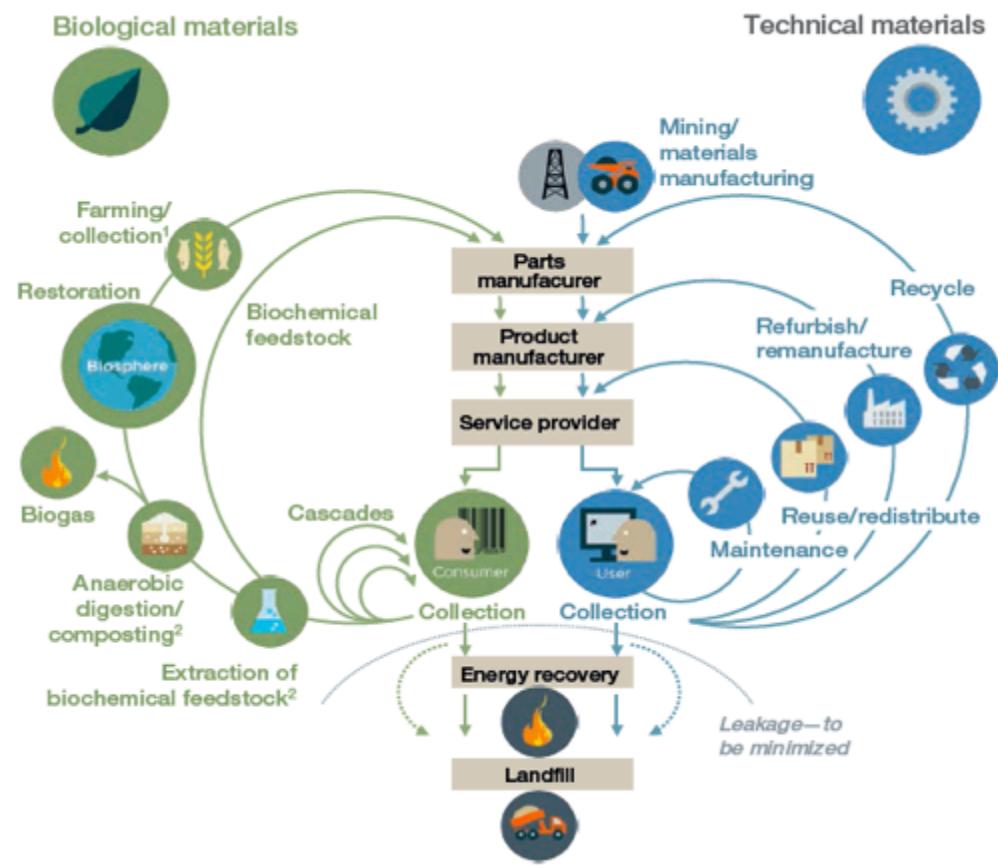


Premises

- The City of Mantova and its Lakes are a UNESCO site, and also one of the major “Chemical Poles” in Northern Italy
- Loss of competitiveness of the traditional fossil fuel based industries, in part for increasing environmental regulations, has determined a growing interest in more sustainable and eco-compatible industrial cycles
- The area benefits of favorable conditions for a biorefinery: high biomass yield potential and crop residues, excellent logistics by fluvial barge and railways, active agriculture and agro-industry to use the new products in a circular economy perspective

Circular economy

Traditional economies have developed according to the model “take-make-consume and dispose” pattern of growth – a linear model which assumes that resources are abundant, available and cheap to dispose of



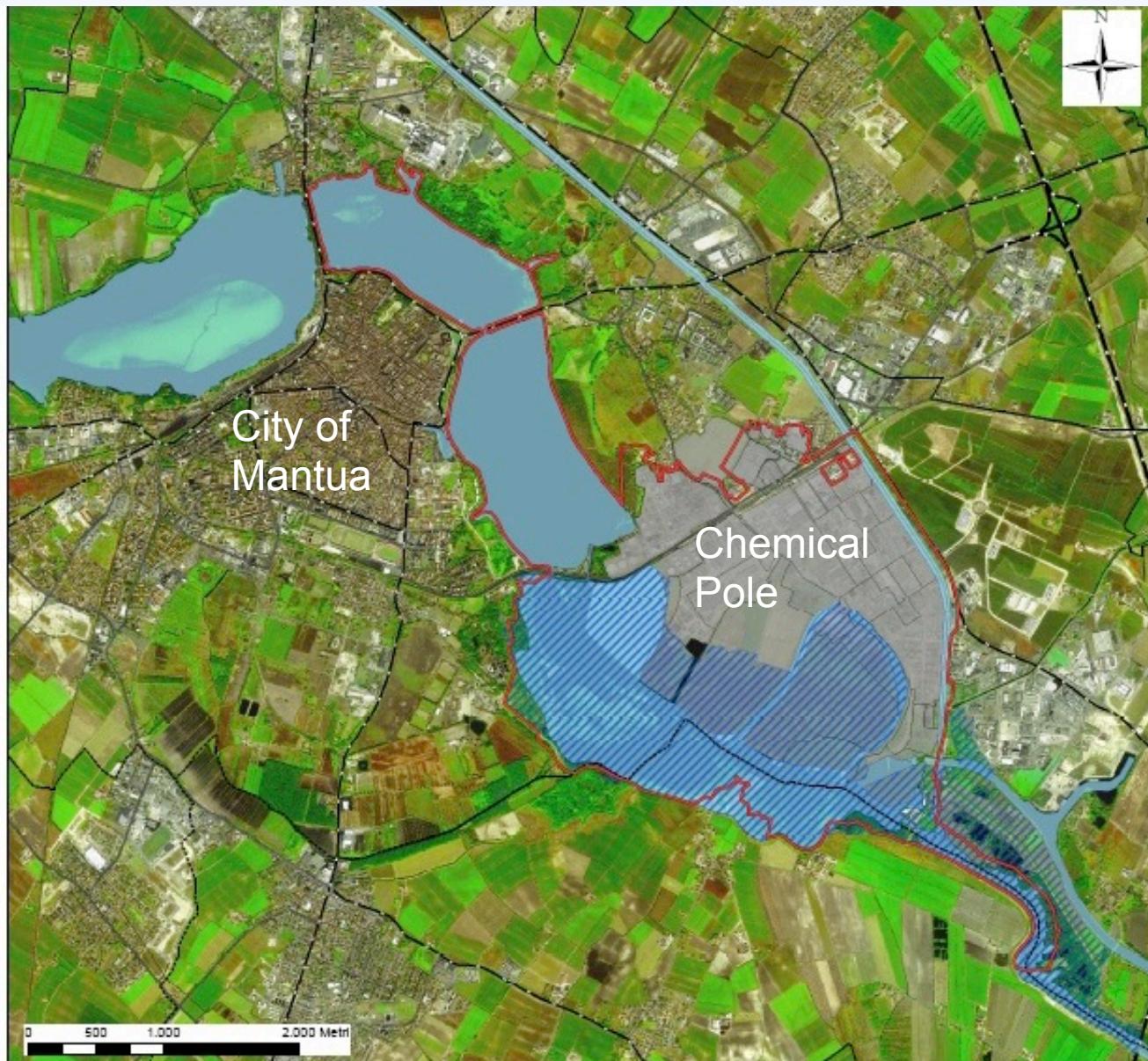
Circular economy means using sustainable local resources, re-using, repairing, refurbishing and recycling existing materials and products. What used to be regarded as ‘waste’ can be turned into a resource. All resources need to be managed more efficiently throughout their life cycle, triggering locally new activities and job opportunities



The BIO-MAN Project

- A collaboration project among Politecnico Milano, Consortium INSTM, Consortium ItalBiotech, and Agire-Agency for Biomass of the Province of Mantua, funded by Fondazione CARIPLO, aiming at:
 - preparing a sustainable biomass procurement plan for a new Biorefinery to be established at the Chemical Pole of Mantua, in compliance with the Biorefinery Decree
 - avoiding potential stress to the nearby area for soil price and crop destination, as a consequence of competition for best soils between present traditional food production chains and the new Biorefinery project

The context of the project



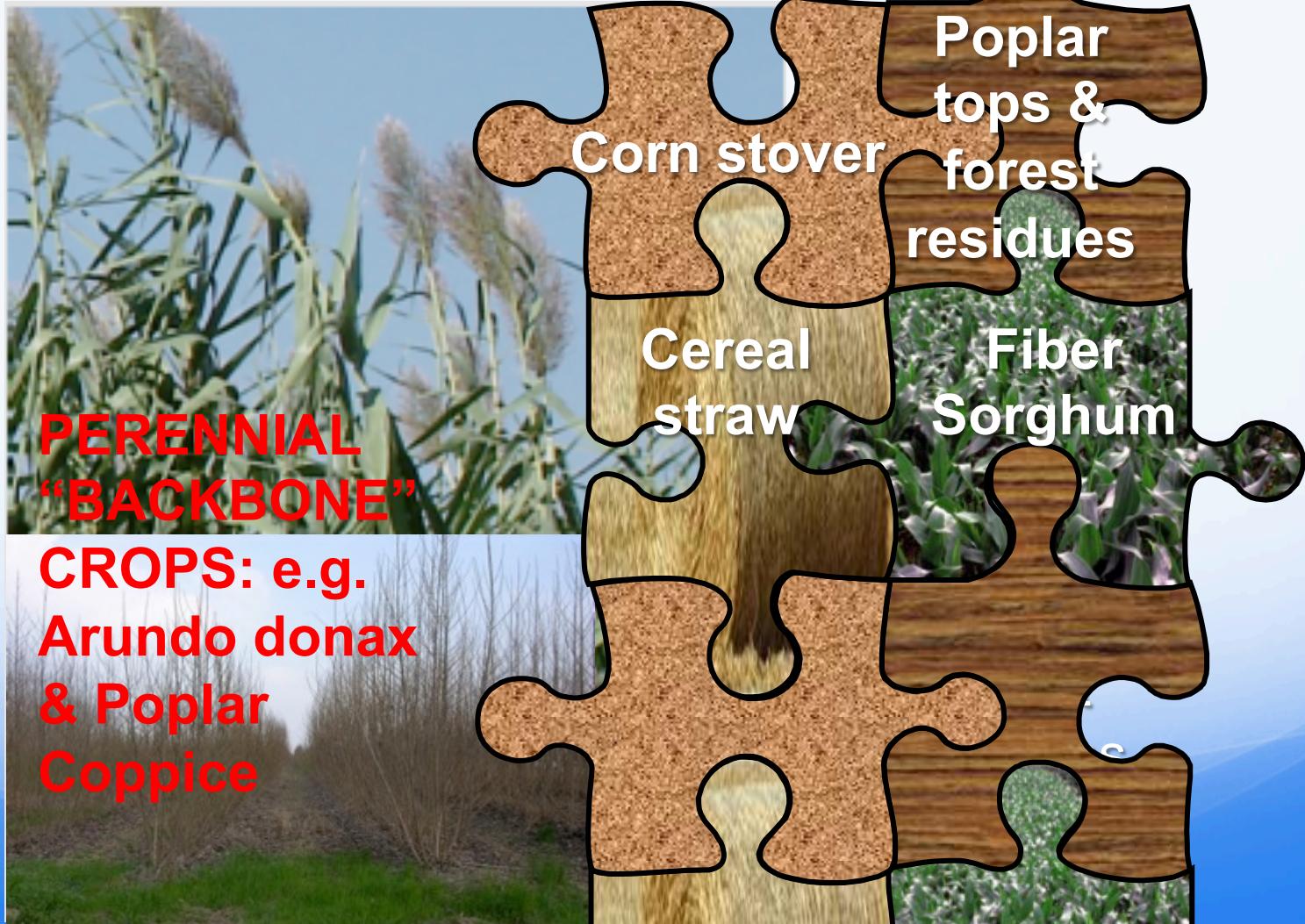
Confini Comunali - Regione Lombardia

Legenda	
—	Perimetro SIN
—	Limite comunale
—	SIC - La Vallazza
—	Idrologia superficiale
—	Polo chimico
Viabilità	
—	Strade principali
—	Strade secondarie
—	Altre strade

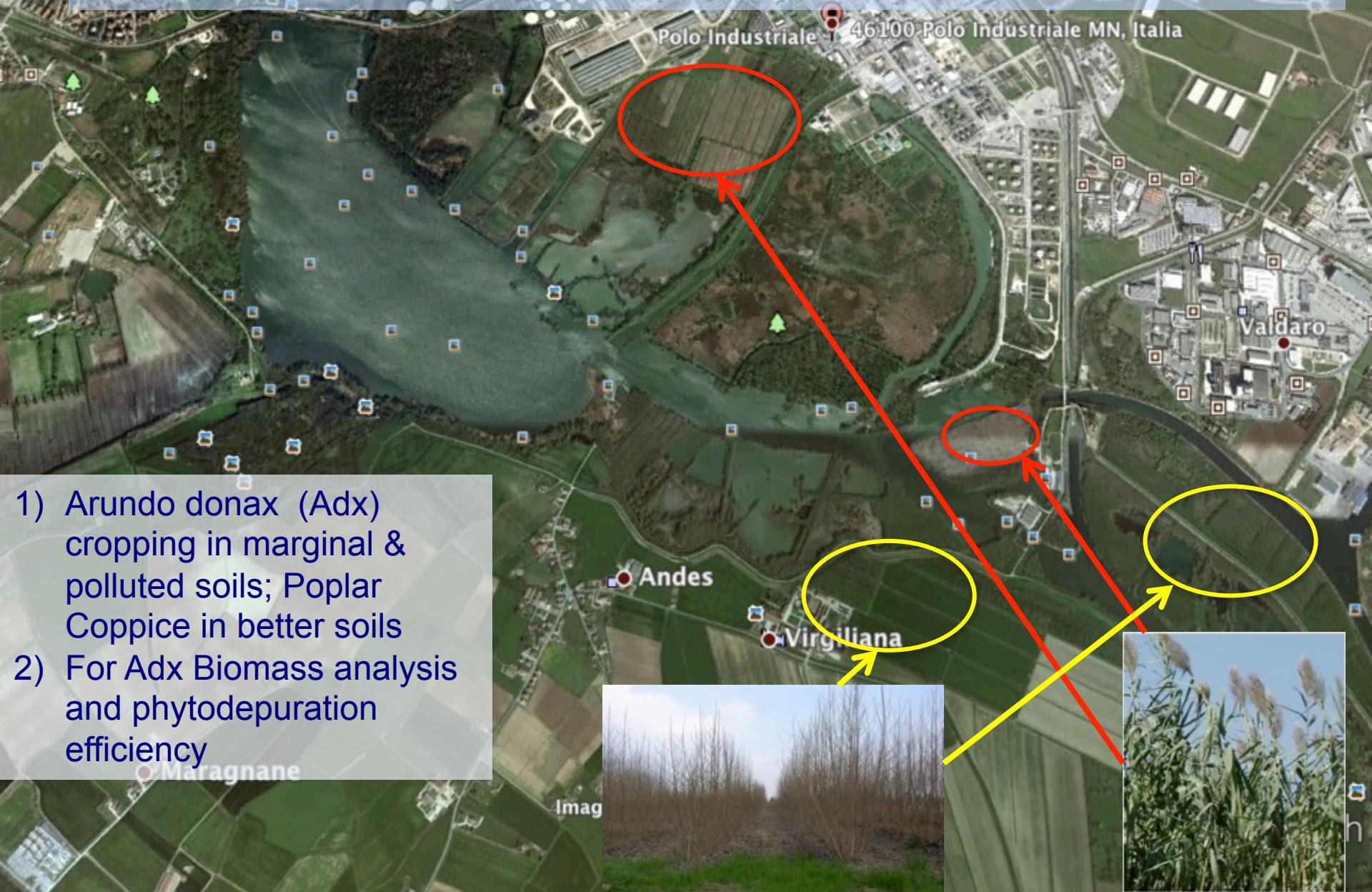
Actions targeted to prepare a sustainable biomass procurement plan

- 1.1) Evaluation of land use and selection of crop residues (corn stover, rice straw, poplar tops) and new crops (Short Rotation Coppice of poplar, Arundo donax, Fiber Sorghum) for marginal soils
- 1.2) Collection of natural vegetation by an innovative supply-chain in the area of Mantua and its Lakes
- 1.3) Analytical characterization of the various biomass sources
- 1.4) Database and mapping of the Biomass in the Area of Mantua, and time schedule of its use

A SUSTAINABLE MIX OF CROPS & CROP RESIDUES



LAND ECOTYPES AND ACTIONS (1)



LAND ECOTYPES and ACTIONS (2)



NATURAL AREA

- 1) Natural Biomass Analysis, and Collection
(programmed clipping for biomass rejuvenation and channel maintenance)
- 2) Evaluation of Natural Biomass phytodepuration efficiency
- 3) Natural Biomass use for energy and material processes

Actions targeted to trigger circular economy opportunities in the area

- 2.1) Energy-effective conversion of lignocellulosic biomass to bioethanol
- 2.2) Production of xylitol and selected compounds for food/feed/pharma from lignocellulosic biomass/process
- 2.3) Conversion of lignocellulosic biomass/process residues to particle boards and biochar
- 2.4) Reusing the effluents
- 2.4) Modeling of the overall energy/efficiency and LCA

Circular economy opportunities

NURSERY & CROP GROWING/HARVESTING



SALTS &
MINERALS
(FERTILIZERS)

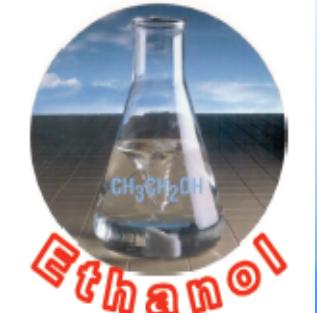
BIOCHAR
(FERTILIZER)

BIOMASS BIOREFINERY

C5

Lignin

C6



PHARMA
EXTRACTS





courtesy L. Bottani

Thank You

Acknowledgements:

The Province of Mantua, Lombardia (Italy)



Fondazione CARIPLO for funding this project

