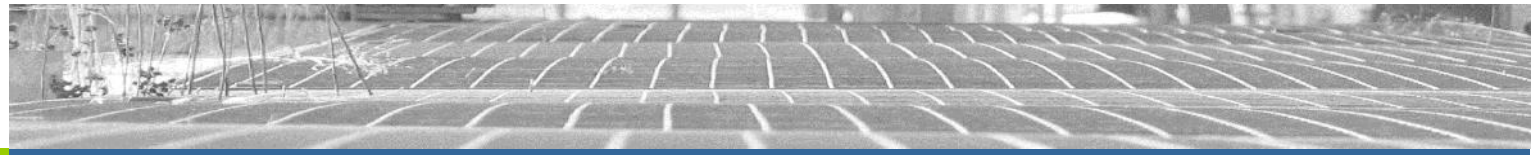

Energy Master Plan for Aguascalientes, Mexico

Professor Dr. Peter Heck
CEO | Institute for applied Material Flow Management [IfaS]

Umwelt-Campus Birkenfeld
FACHHOCHSCHULE TRIER

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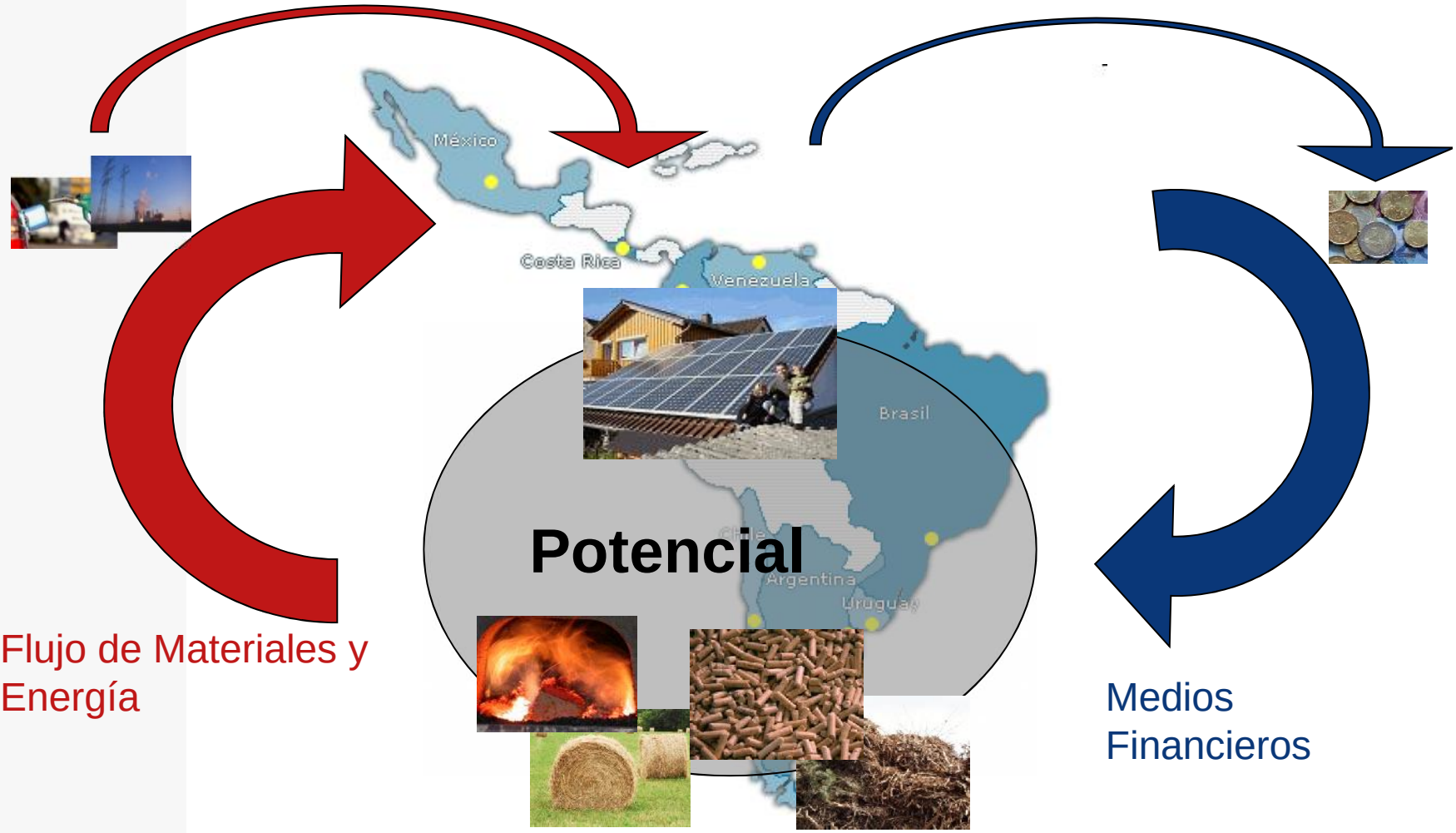
ECB - The Zero Emission Campus

Flujo de Materiales y Energía con GFME



Project Motivation for Master Plan

- Enhance energy efficiency and renewable energies
- Reduce environmental pollution
- Create regional jobs
- Develop better economic conditions for production companies
- Create added value for the people
- Create an innovate research and implementation core
- Reduce carbon emissions

- **Aguascalientes as the implementation model for the new energy policy in Mexico**

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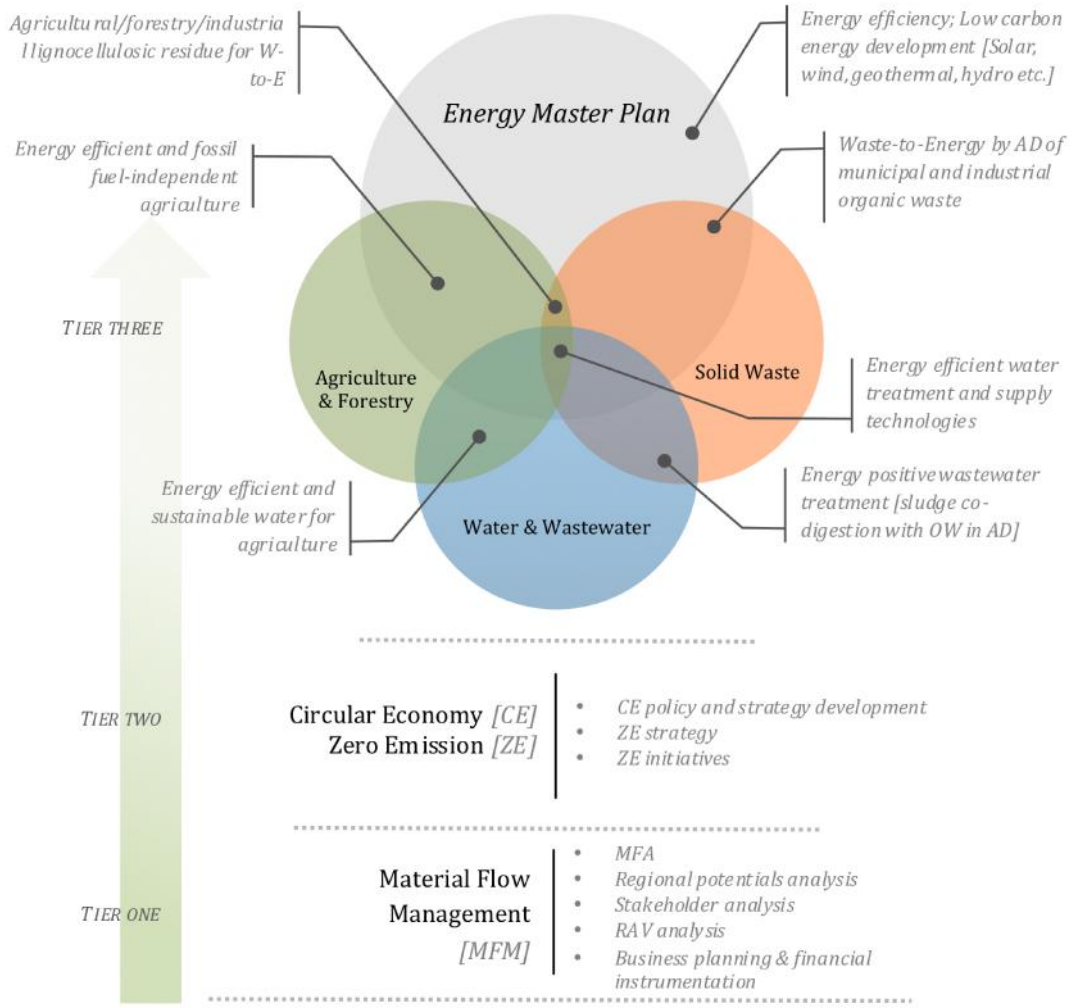
Approach & key considerations



EMP Project development

- **Energy efficiency**
- **Industry,**
- **Public**
- **Households**
- **Agriculture**

- **Renewable energies**

1. Biomass
2. Waste to energy
3. Solar
4. Wind
5. Geothermal

Approach & key considerations

- use of MFM tool for the qualification & quantification of material and energy flows & potentials analysis

- development of the policy framework/strategy for EMP employing Circular Economy and Zero Emission concepts

- define the core working areas and the respective undertakings in-line with the EMP policy/strategy

Three-tier approach for EMP development

Project idea: Energy Service Company

Empresa Servicios Energeticos Aguascalienetes
ESEA

- Establishing an Energy Service Company (PPP with Government of Aguascalientes, KFW/DEG, German/RLP energy utilities/companies)
- AESCO/ESEA will invest and operate RE and EE in Aguascalientes
- Implementing wind parcs, solar parcs, biogas plants (waste to energy), efficency strategies like LED street lighting), waste to energy and energy positive waste water treatment

EMP Project Development

- Analisis de Flujo de Materiales AFM
- Analisis de Potenciales Regionales
- Analisis de Posibilidades de NAMA (LAMA) Apropriados
- Analisis de Valor Agregado Regional VAR
- Plan de Negocios e Instrumentacion Financiera

Work plan

Step 1: Material Flow Analysis for the area of Aguascalientes

- Identify current material and energy flows
  1. Total energy consumption
     1. Electricity → **MWh/a**
     2. Heat
  2. Brake down per sectors
     1. Private households
     2. Public buildings
     3. Industry, Trade & Service
     4. Transport
- Identify related financial flows

  Money spent on energy supply in the Municipality
  1. Electricity, Cold, Heat → Peso
  2. Transport

Renewable energies, required data

- Biomass (biogas and solid fuel)
  - Area distribution
    - Settlement, Agricultural land, Grass land, Forest area
  - Agricultural land
    - Size of the arable land and ownership structure
    - Cultivation mixture (wheat, corn, oat, barley, rye vegetables, potatoes… in ha)
    - Animal manure (Number of cows, diary cattle, pigs, poultry)
  - Forest potential
    - State/Community forests (in ha), growth/a
  - Bio mass from the municipality
    - Bio waste, green waste, waste wood (kg/inhb.)
  - Greenery
    - Length of roads, railway and water bodies in the

Renewable energies, required data

- **Wind and Solar**
  - Determination of the areas within the municipality favorable for the installations of the wind turbines and PV plnats
  - Inclusion of the restriction (airport, protected areas…)
  - Determination of the capacity of wind turbines and PV plants

Example: Total energy consumption

- Electricity and heat consumption in the community, divided by sectors

Total energy consumption						
	Private households	Trade & Services	Industry	Community properties	Transport	Total
Electricity	17.000 MWh/a	55.257 MWh/a	140.000 MWh/a	996 MWh/a	0 MWh/a	213.253 MWh/a
Heating	96.389 MWh/a	8.019 MWh/a	11.820 MWh/a	4.799 MWh/a	44.445 MWh/a	165.472 MWh/a
Total	**113.389 MWh/a**	**63.276 MWh/a**	**151.820 MWh/a**	**5.795 MWh/a**	**44.445 MWh/a**	**378.725 MWh/a**
%	30%	17%	40%	2%	12%	100%

- Amount of renewable electricity generated and fed into the grid

Distribution according to energy carriers/ origin		
Purchased electricity mix	173.299 MWh	81,3%
Renewable	39.954 MWh	18,7%
Wind power	29.428 MWh	73,7%
Photovoltaic on rooftop	1.709 MWh	4,3%
Photovoltaic on open spaces	3.600 MWh	9,0%
Hydropower	17 MWh	0,0%
CHP (RE)	5.200 MWh	13,0%

Stakeholder Management

- (Municipality) Workshops
  - Based on various topics (heating, cooling, RE, etc)
  - Based on different stakeholders (public, industry, citizens, etc)
- Academic Capacity Building
  - IMAT (International Material Flow Management)
  - Topic based training courses and technology site visits
- Non-Academic Capacity Building
  - Training program for craftsmen
  - Training program for community advisors
  - Training and qualification program for informal sector participations (e.g. in waste technologies)
  - Fundraising and Business Planning

EMP Project development

<u>Step 2:</u> Green Business and Strategy Development

- Based on the MFA results, green business opportunities and strategy for each Municipality
- Development of a set of project possibilities and conduct economic pre-feasibility analysis of the projects

  Energy

  - Energy efficiency

  1. Street lighting
  2. District heating systems
  3. Insulation
  4. Office and home lighting

Principle Objectives

- Develop a NAMA (LAMA) concept for the municipal waste management sector with a focus on waste-to-energy development

- Develop financing mechanisms/strategies and identify the relevant institutional structures *[eg. PPP models, ESCO or other Energy Service organizations, Reveolving Funds, Citizens' Capital Fund etc.]*

- Develop and execute fundraising strategies

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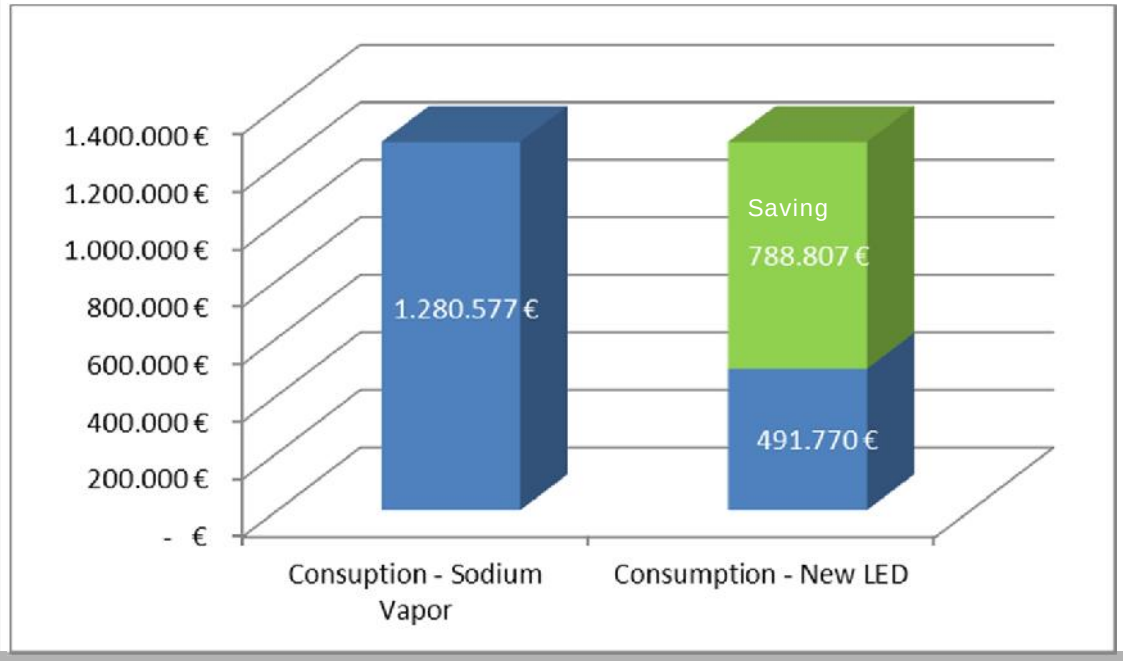
Streetlight – Economic Comparison LED / NAV

Municipalities:

- ASIENTOS
- CALVILLO
- JESÚS MARÍA
- SAN JOSÉ DE GRACIA
- SAN JOSÉ DE GRACIA
- TEPEZALA
- RINCÓN DE ROMOS



450 €/Lamp

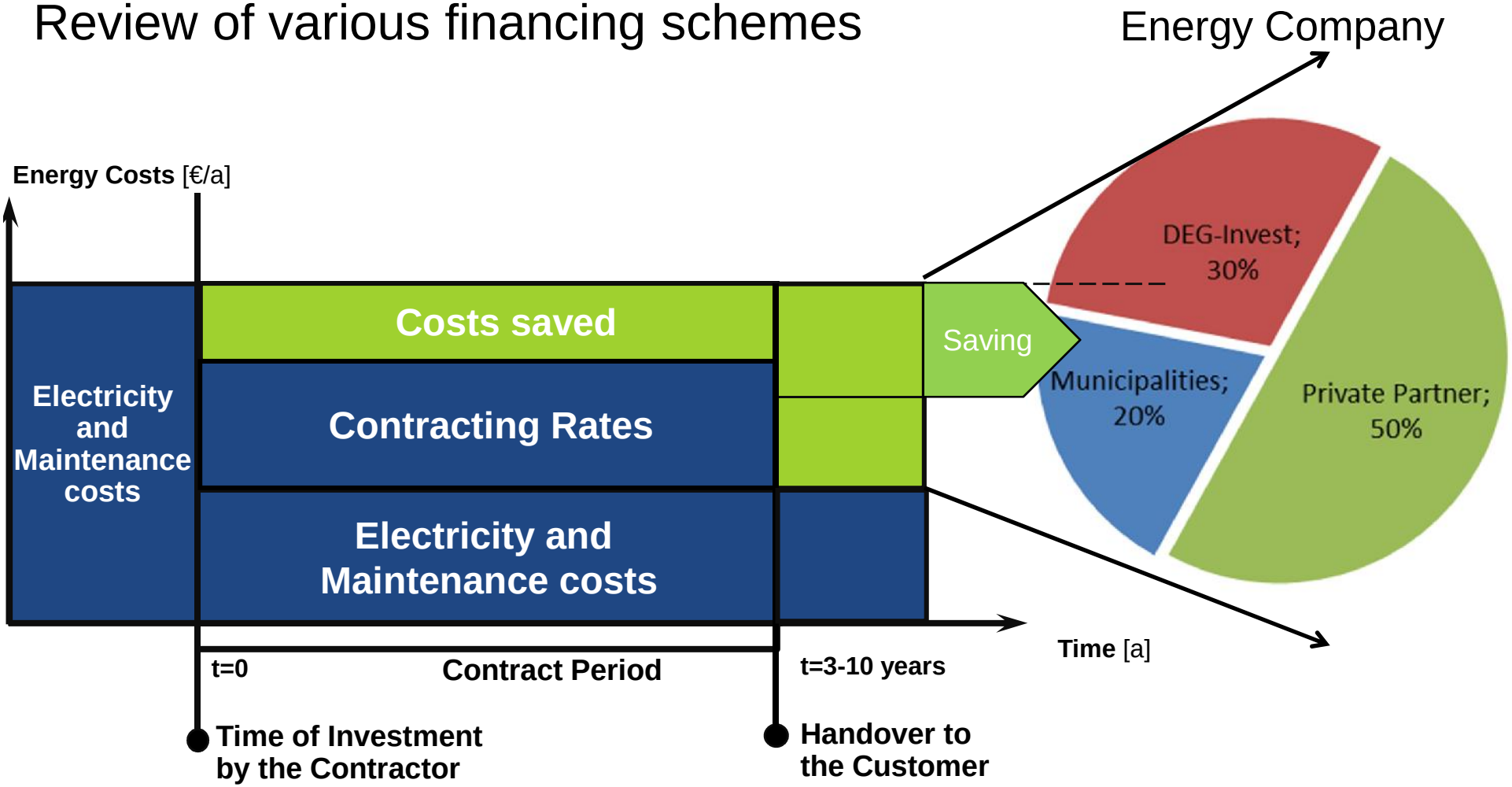
10.192 Pieces

Invest:

4.586.400 €

Example - LED Streetlight

Review of various financing schemes



Project implementation

- Energy Master Plan as a base for Public Private Partnership
- Mexican experts will develop the Master Plan in close cooperation with IfaS
- Study tours back and forth will support the Master Plan
- Travelling University gives first potentials and project opportunities

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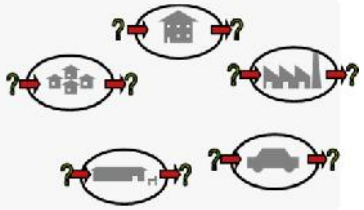
Discover the Secret….

Muchas gracias por su atención



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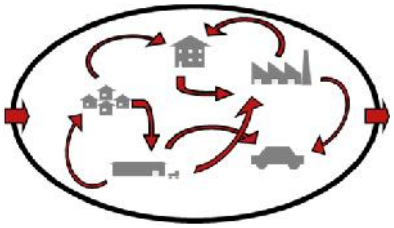

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