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Regional Meeting to review the used lube oil ESM guidelines and best practices towards sustainable tannery sector in the Mediterranean

July 22nd – 24th, 2015 - Barcelona

The Algerian Waste lube oil pilot project: a technical and economic study of the collection and recycling of lubricant oils

Presenter:

Professor Dr. Angelis Vlahou

Regional Activity Centre for Sustainable Consumption and Production

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THE ALGERIAN WASTE LUBE OIL PILOT PROJECT: A TECHNICAL AND ECONOMIC STUDY OF THE COLLECTION AND RECYCLING OF LUBRICANT OILS

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- CHAPTER 1. INTRODUCTION
- 1.1. INTRODUCTION
- 1.2. AN ECONOMIC FEASIBILITY STUDY FOR WLOs PILOT PROJECT
- 1.3 WHAT IS WASTE LUBE OIL?
- 1.4 THE ENVIRONMENTAL PROBLEM WITH THE USED OIL
- ✓ 1.5. THE SCOPE OF THE STUDY
- ✓ 1.6. STUDY AREAS AND RESEARCH QUESTIONS

1.5. THE SCOPE OF THE STUDY

The specifications of the study call for four main tasks to be completed:

- Develop technical options for the collection and recycling of lubricating oils in accordance with sound environmental standards and international law.
- Undertake an economic evaluation of the recommended technical options.
- Calculate the costs including the direct cost, indirect cost, and general expense.
- Submit the profitability analysis, and the payback period.

✓ 1.6. STUDY AREAS AND RESEARCH QUESTIONS

RESEARCH QUESTIONS

- Q1. Question 1: Is the market context (internal & external) within which the proposed WLOs system intends to operate conducive to its long term viability that could justify the country's investment in the pilot project?
- Q2. Question 2: Where, by whom, and how much of waste lube oil is annually generated in Algeria?
- Q3. Question 3: What possible experiential options are internationally available for Algeria to draw upon and develop its own innovative WLOs recycling policy model for its Pilot Project system?
- Q4. Question 4: What technical installation and equipment are necessary for a WLOs Pilot Project?
- Q5. Question 5: Is an Algerian WLOs Pilot Project economically feasible?

- ✓ Q6. What Steps Must be Taken to Implement a Pilot Project?

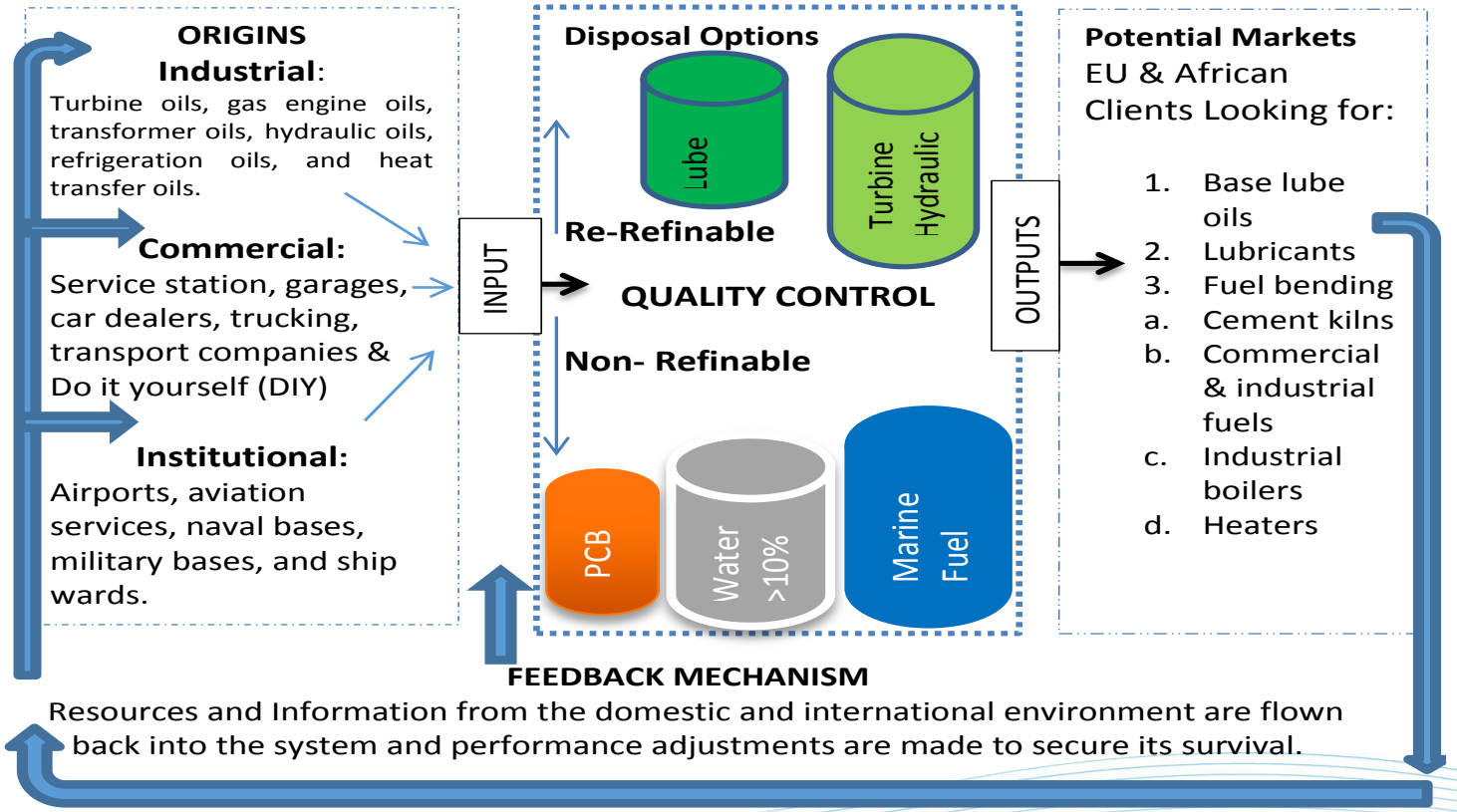
There is also a sixth question but this is rather a general question intended to bring a closure to the study and provide a future orientation for the stakeholder and general audience.

2.6. THE ALGIERS WLOS PILOT PROJECT FACILITY

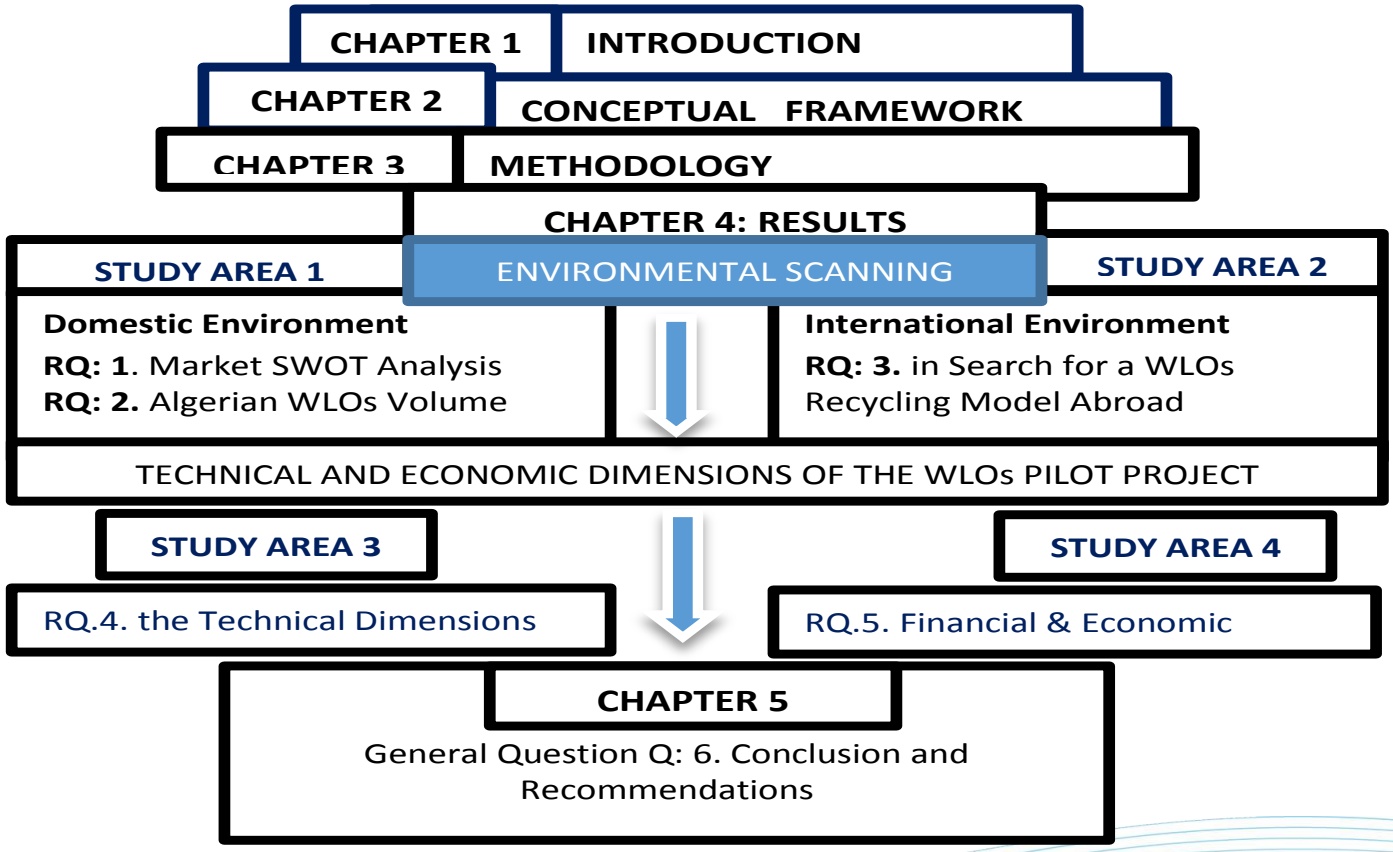
The following is an overview of the process of selecting a model for an Algerian Waste Lube Oil (WLOs) pilot processing facility (PPF) that is geared to accomplish the following objectives:

- ✓ (1) To develop and maintain a data base of used oil generators and suppliers throughout Algeria aligned to the purpose of monitoring the systems inputs and outputs of WLOs and to forecast future supplies, demands and prices;
- ✓ (2) To monitor and coordinate the flow of used oils into the national market collected by either private or public firms;
- ✓ (3) To collect and transport WLOs into its own facility in Algiers and segregate it into various types of readily available value added products suited for (fuel or basic lube oil) recycling purposes;
- ✓ (4) To promote the sale of these products into domestic and international markets for a price that helps finance the facility's costs and share its profits with its collaborators;
- ✓ (5) To undertake studies linked to discovering of the best and efficient way of accomplishing the above objectives; and finally,
- ✓ (6) To propose legislation, or amendments to rules, governing the WLOs recycling system.

CHAPTER 3. METHODS & CONCEPTUAL FRAMEWORK

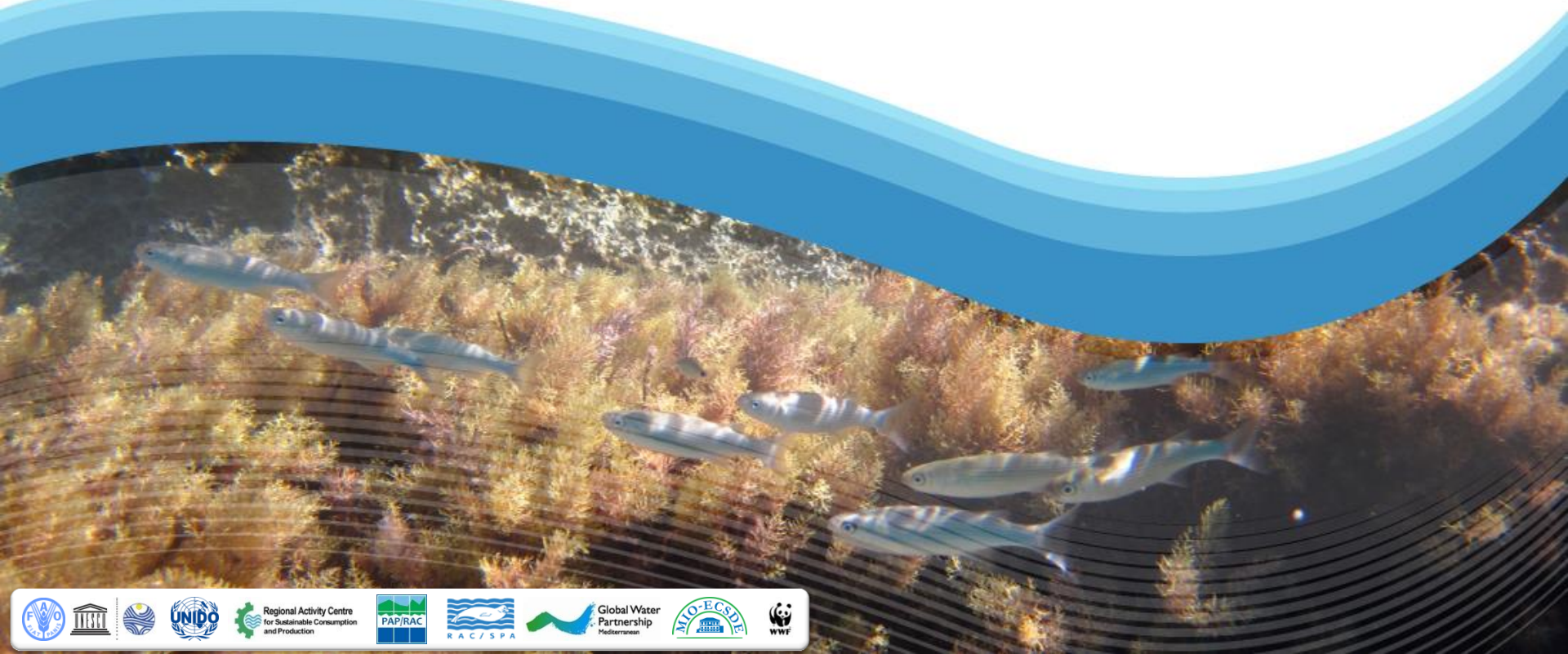


THE STRUCTURE OF THE STUDY



4.1 RESEARCH QUESTION 1

Q1. Question 1: Is the market context (internal & external) within which the proposed WLOs system intends to operate conducive to its long term viability that could justify the country's investment in the pilot project? What if there is no market demand for the product and services the waste lube oil pilot project intends to offer?



ENVIRONMENTAL SCANING : SWOT ANALYSIS

	WLOs Pilot Project Facility	Competitor Type A Private & public collection WLOs enterprises currently supplying domestic & foreign clients re-refining	Competitor Type B Used Oil Burners Cement Kilns, Steel Mills, Utility Boilers, Industrial, Space Heaters, & Asphalt Plant
S	The quality of the new lube oils entering the market plus the quality control of the processing facility will guaranty a better used oil for exports than in the past	They have been operating in this market for a long time and have developed strong relations with the generators	Product is cheaper than A and sells well They offer good margin to retailers.
W	. Algerian WLOs are known as being heavily contaminated creating re-refining problems and producing too less base lube oils than is expected.	Gradually they will face hard times of selling their WLOs since their clients shift to Pilot Facility for cleaner and and less expensive supply of fuel	Poor quality product, poor label design. I'm told by retailers that supplies are irregular and not always the amount ordered.
O	There are new re-refining facilities built in France, Algeria, & Tunisia and soon will be in need for large quantities of used oils for their operations. Paying $120.00 per ton or even a bit more will be just the right price if it is free of contaminants	Hunting for cash they will sale their good oil supply to facility all too often until they become regular clients. In the end, they will be exchanging used lube oils for cleaner fuel which in turn they will be delivering to their own clients.- fuel burners	The fuel burners tired of receiving less and less of good quality of used oil might sift for cleaner supply to Pilot facility until they will realized that are better off in term of price and quality
T	The slow movement of the Algerian bureaucratic red tape & the infighting for the leadership of the facility might slow the process or even kill the idea	Private collector will offer money to generators under table for their oil supply at the cost of making less profit	The presence of a new player in the market will cause to them seek more supplies only to cause price increases which they no longer can afford.

SWOT ANALYSIS

INTERNAL	EXTERNAL
Strengths **Low collection costs due low fuel prices and labor salaries and wages compared to European**	Opportunities In African and European Markets Algerian WLOs can be sold to European markets above the $150.00per ton very easily
Weaknesses **1) Algerian WLOs is Problematic without some quality controls;** **2) Private sectors collection infrastructure is underdeveloped ;** **3) Legal framework to enforce recycling compliance is incomplete**	Threats Drops in crude oil prices are a threat to WLOs pilot project's revenue.

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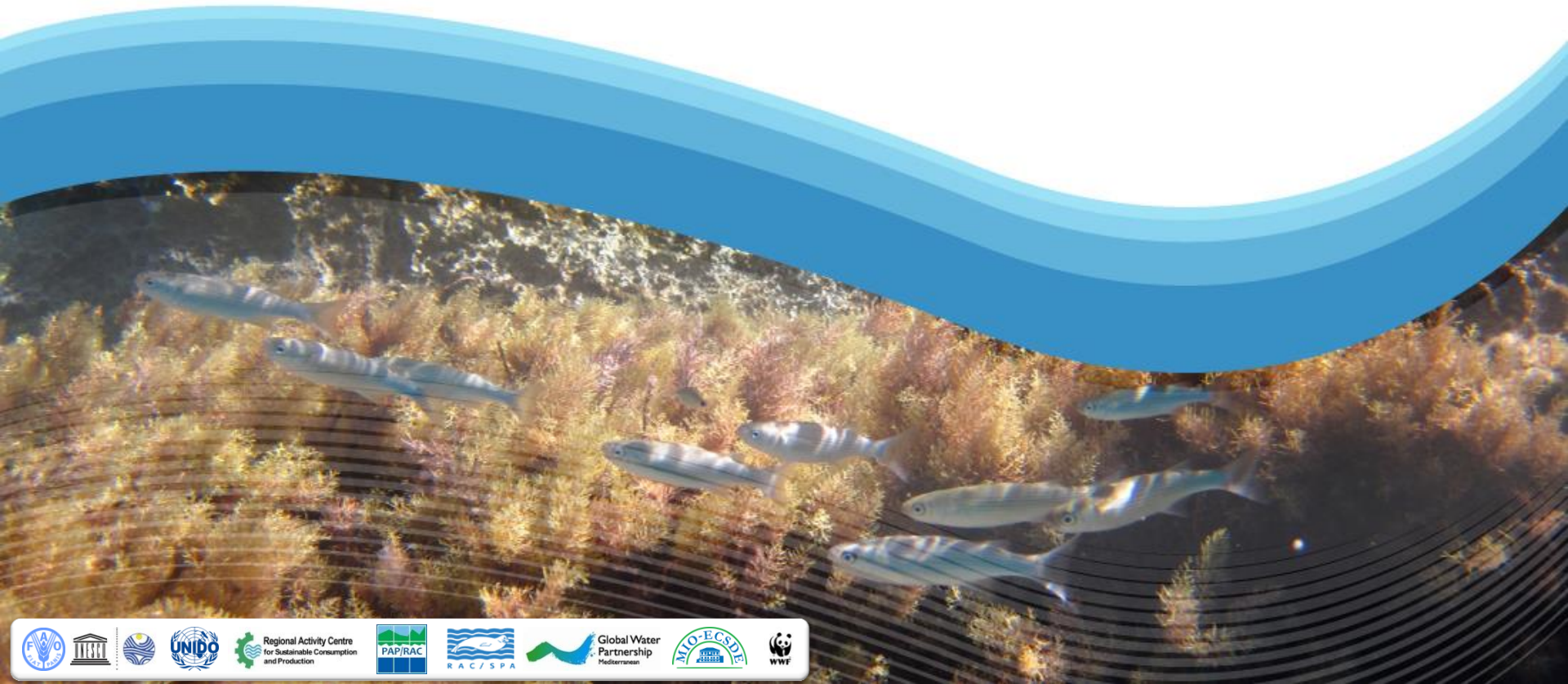
4.2 RESEARCH QUESTION 2

Q2. Question 2: How much of waste lube oil is annually generated in Algeria?



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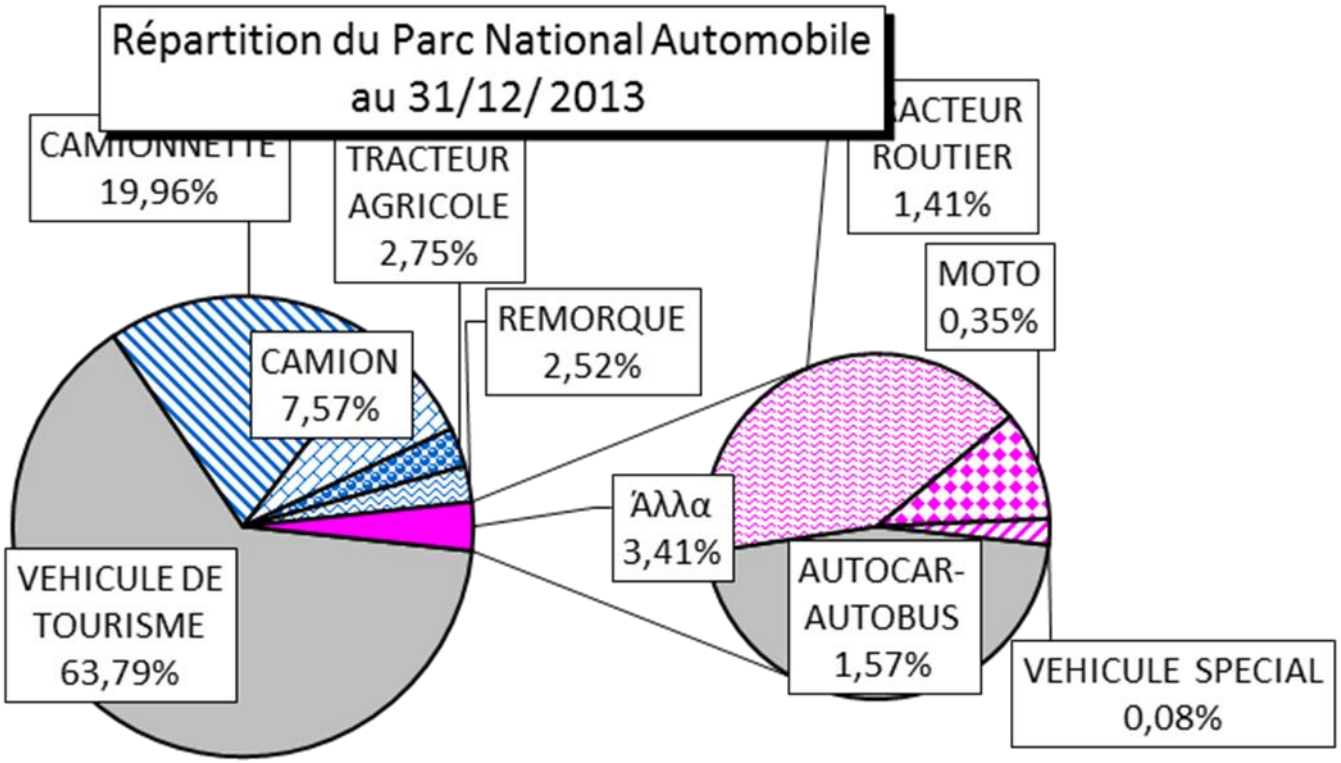
ALGERIAN AUTOMOBILE FLEET

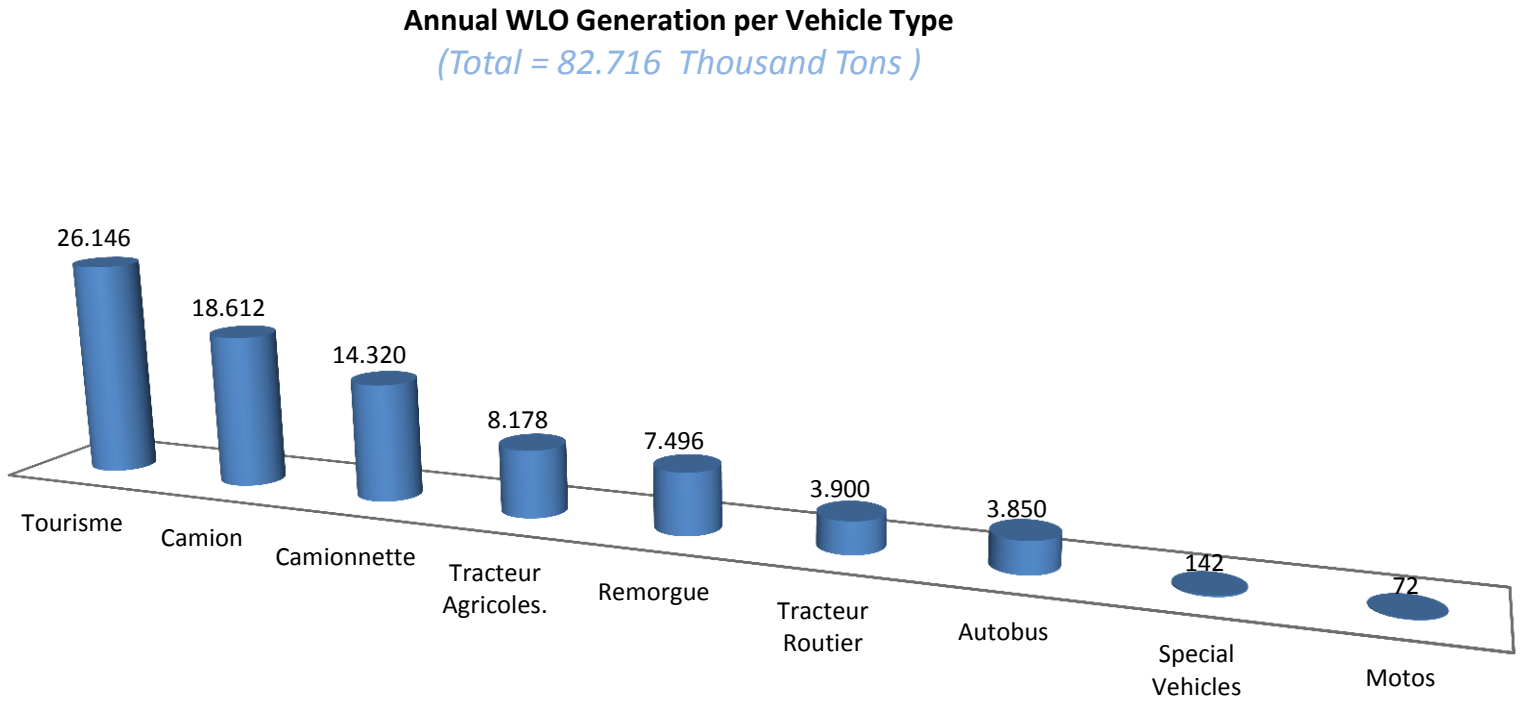


VEHICLE TYPES & WLOs GENERATION

GENRE DU VEHICULE	NOMBRE	AV. LITERS	USED OIL IN TONS
Vehicles de tourisme	3.268.220	4	13.073
Camion	387.750	24	9.306
Camionnette	1.022.859	7	7.160
Autocar-autobus	80.212	24	1.925
Tracteur routier	72.240	27	1.950
Tracteur agricole	141.018	29	4.089
Vehicule special	4.196	17	71
Remorque	129.260	29	3.748
Motos	1.7950	1.5	2.692
TOTAL	5.123.705		41.342

[1] Lolos Th., C. Raptis, G. Lolos, C. Tsompanidis, P. Fragkakis. The waste oil management plan of Cyprus republic: Technical and financial aspects of the proposed strategy. Enviroplan S. A

ANNUAL WLOs GENERATED FROM AUTOMOBILES



Provinces Near Algiers

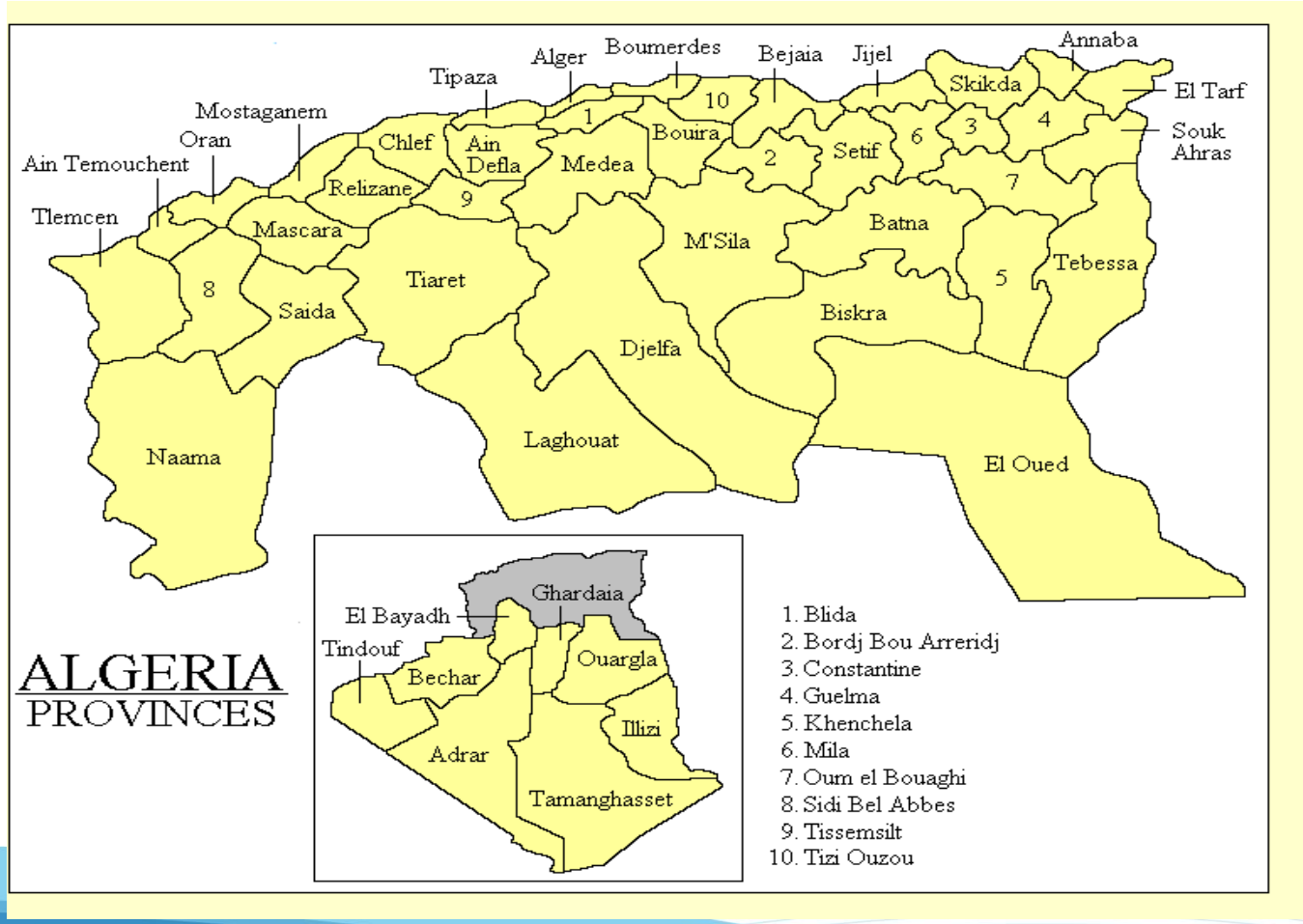
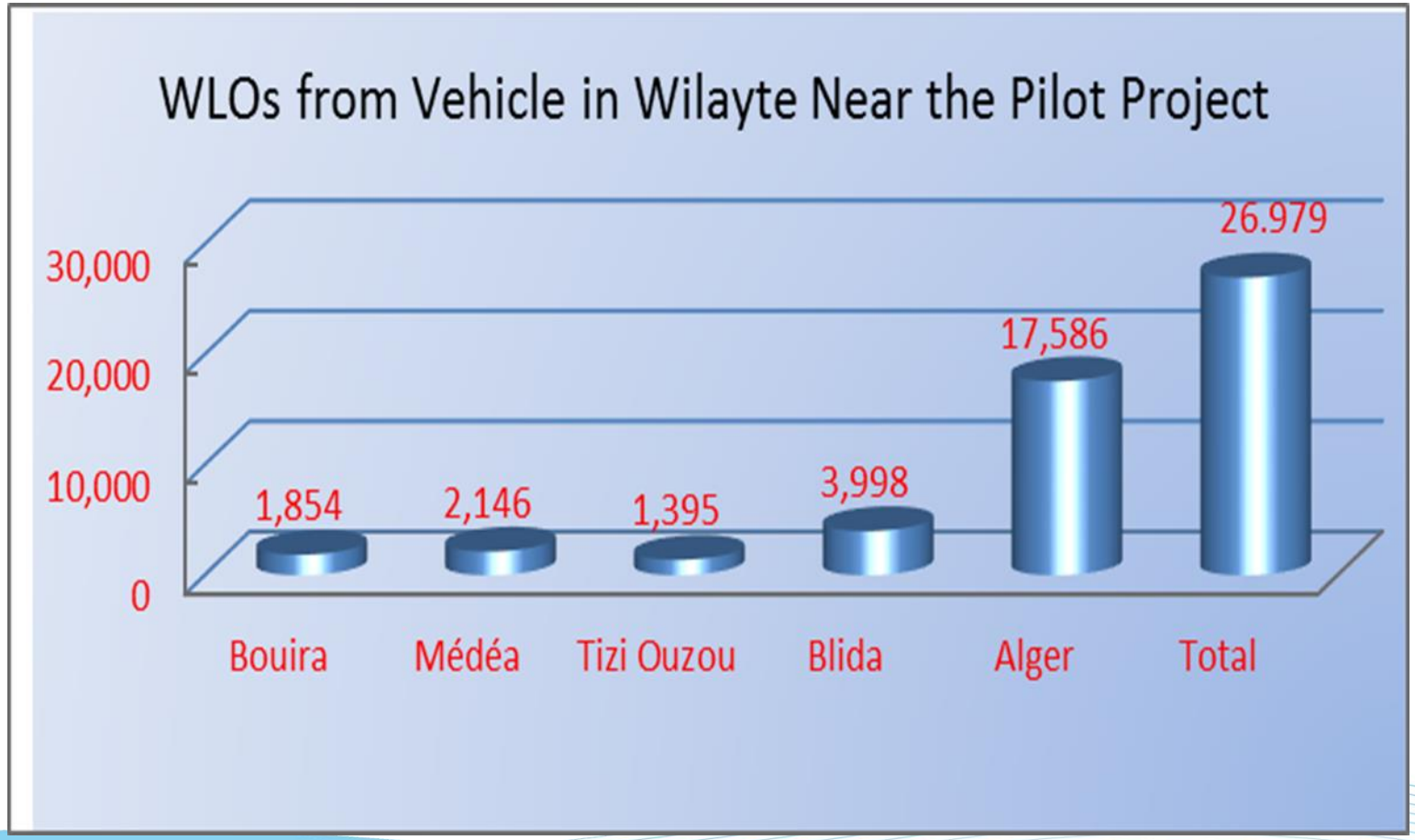


Figure 6: WLOs IN PROVINCES NEAR THE FACILITY'S LOCATION



4.3. RESEARCH QUESTION 3

Q3. Given that Algeria has no previous experience with recycling WLOs, what possible international recycling policy option are available from which it can to draw inspiration and design its own legal framework and administrative policy guidelines to be carried out by the Pilot Project?

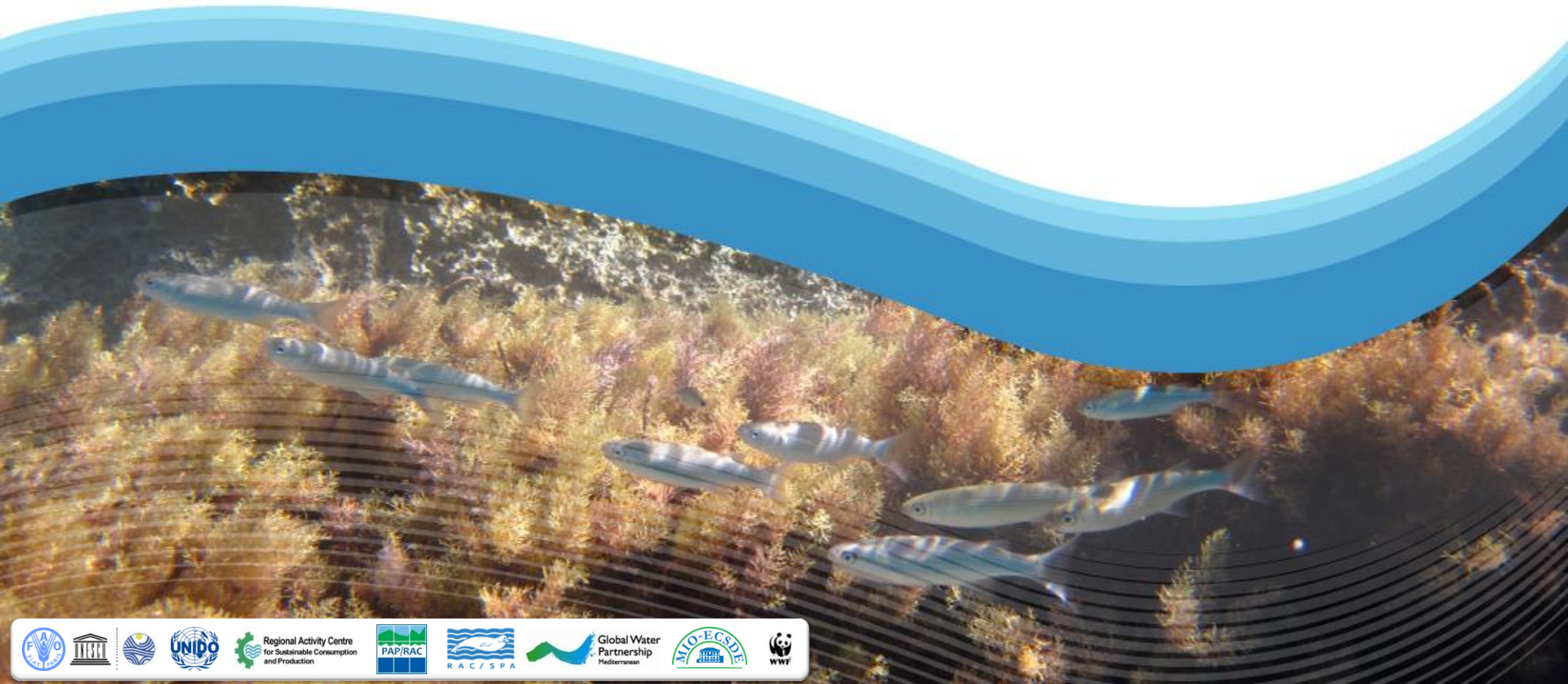


Table 4: Waste Lube Oils Policy Primordial Models

Non-Subsidized			Tax		Subsidized		Tax		
	% Collected	Collection Cost	Fuel Tax	Lube Tax		% Collected	Collection Cost	Fuel Tax	Lube Tax
Austria	74	75	38	378	**Denmark**	75	49.1	0	433
Belgium	79	50	6	0	**Finland**	80	53	58	42
Germany	85	76.5	28	16	**France**	56	72	9	38
Greece	37	47.2	39	0	**Italy**	74	100	38	623
Ireland	86	38	18	0	**Spain**	47	31.5	13	0
Luxemburg	39	n.a.	6	0					
Netherland	72	61	31	0					
Sweden	80	32.3	238	0					
UK	86	38.2	38	0					
Average	70.89	28	55.11	43.7	Average	66	45.00	23.6	167.2

Table 5 Rankings on High Collection & Low Cost Criteria

SUMM OF RANKINGS SCORE ON	COLLECTION	COST &	TAX
Non -Subsidized	Total Ranks	Subsidized	Total Ranks
Ireland	6	Denmark	7
UK	11	Spain	7
Belgium	11	Finland	8
Sweden	14	France	10
Luxemburg	14	Italy	13
Germany	15		
Netherlands	19		
Greece	20		
Austria	21		

DISPOSITION OF WLOs in EUROPE

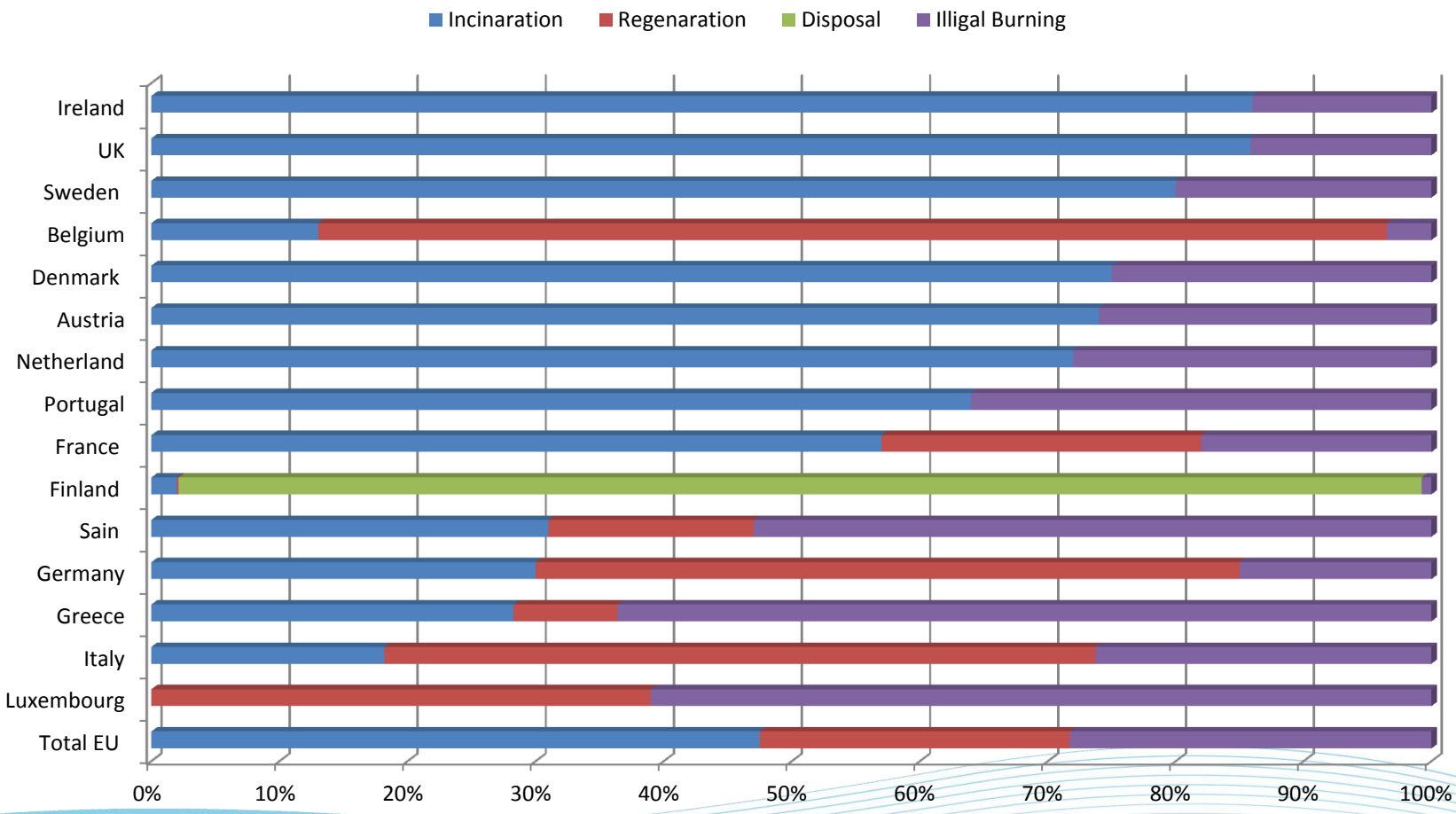


Figure 8: Rankings in CC Goals Criteria & IR Outcomes

CC = Collection and Cost ;

IR = Incineration and Regeneration

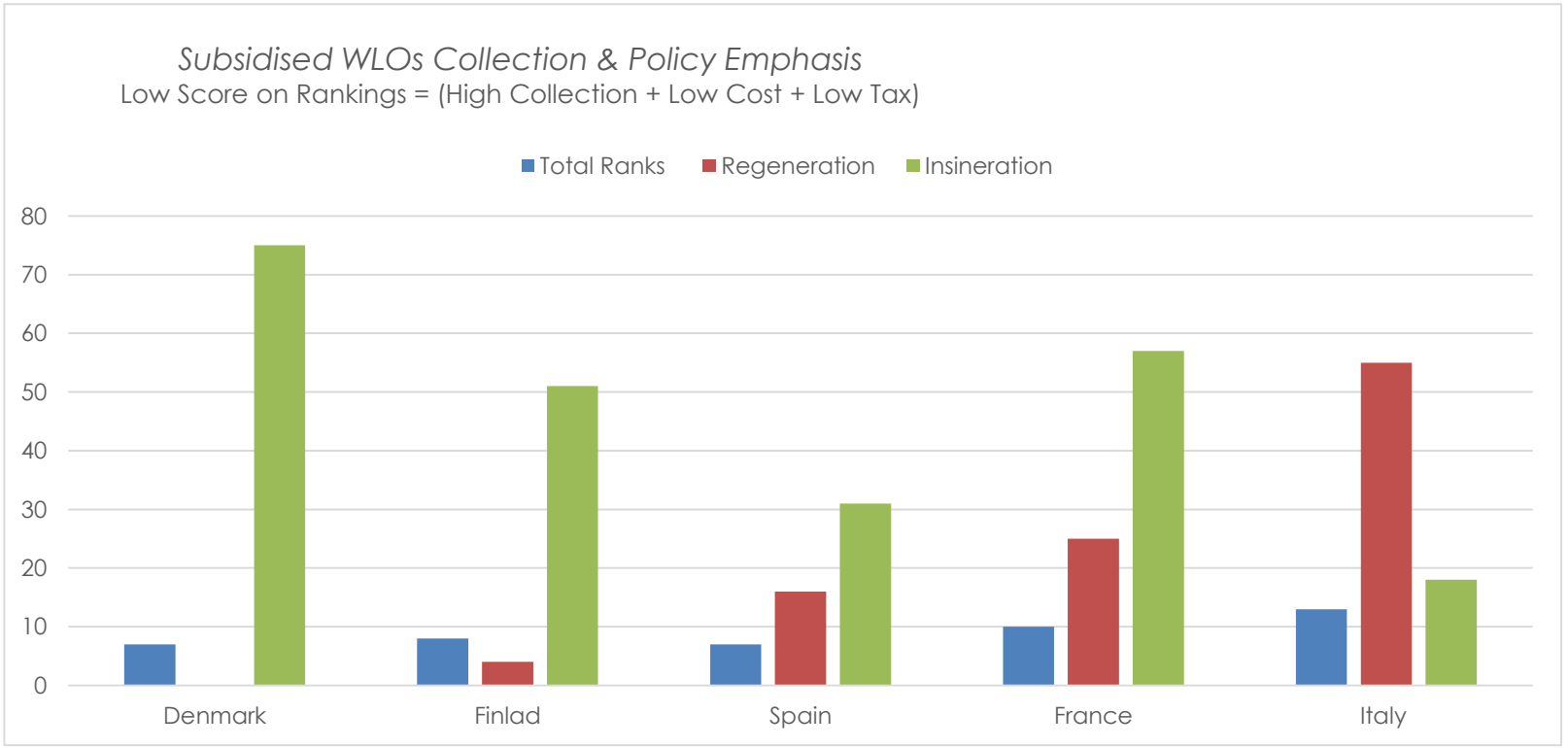
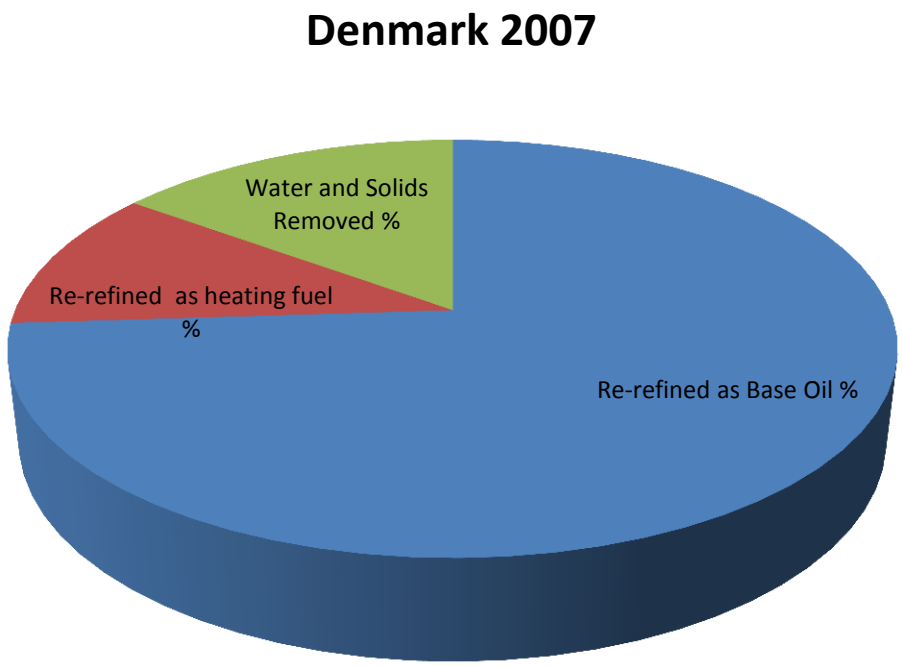


Figure 9: Denmark's WLOs Re-regeneration Priority (After policy change in 2003)



NON SUBSIDIZED WLOs COLLECTION SCHEME

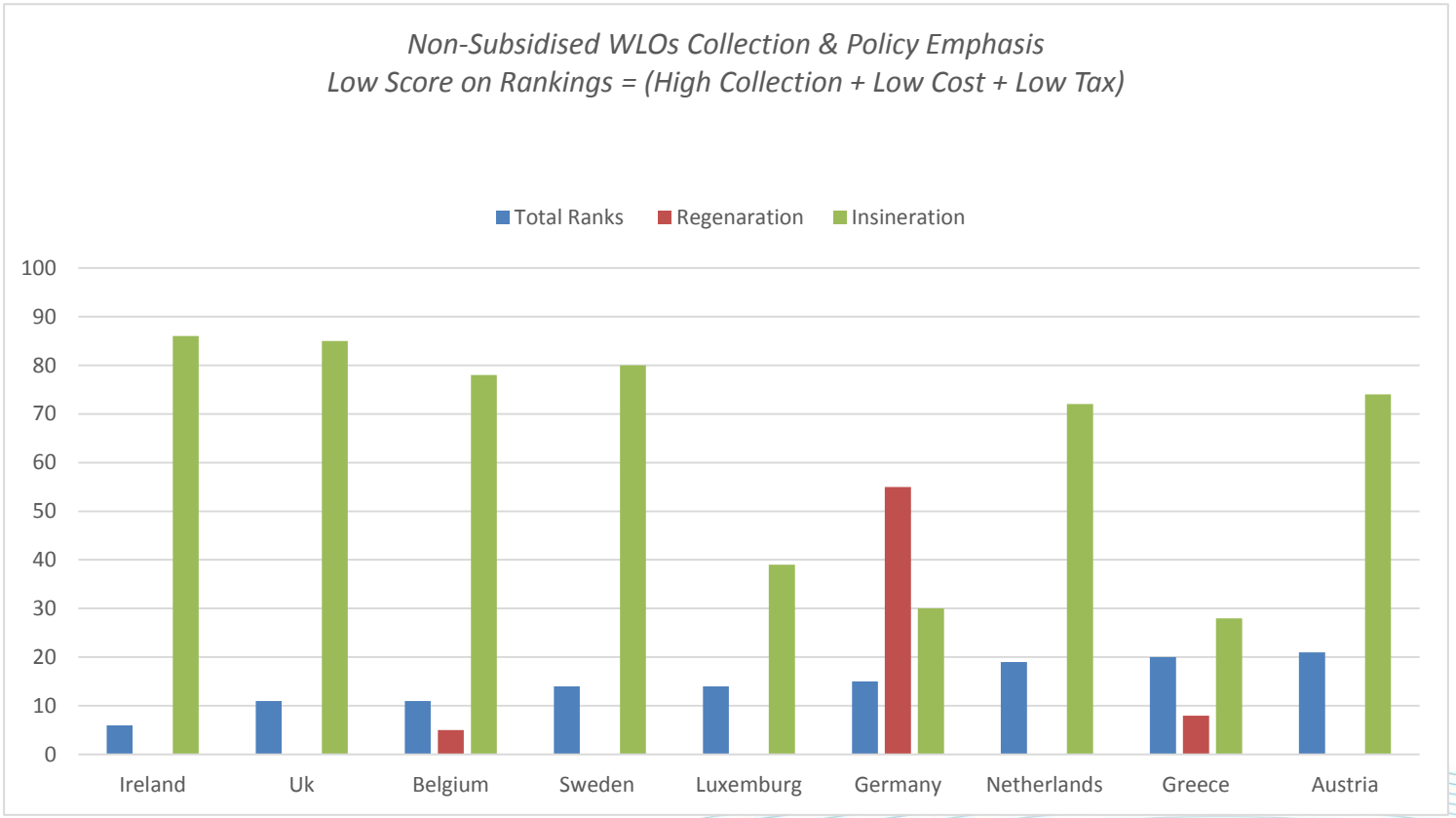
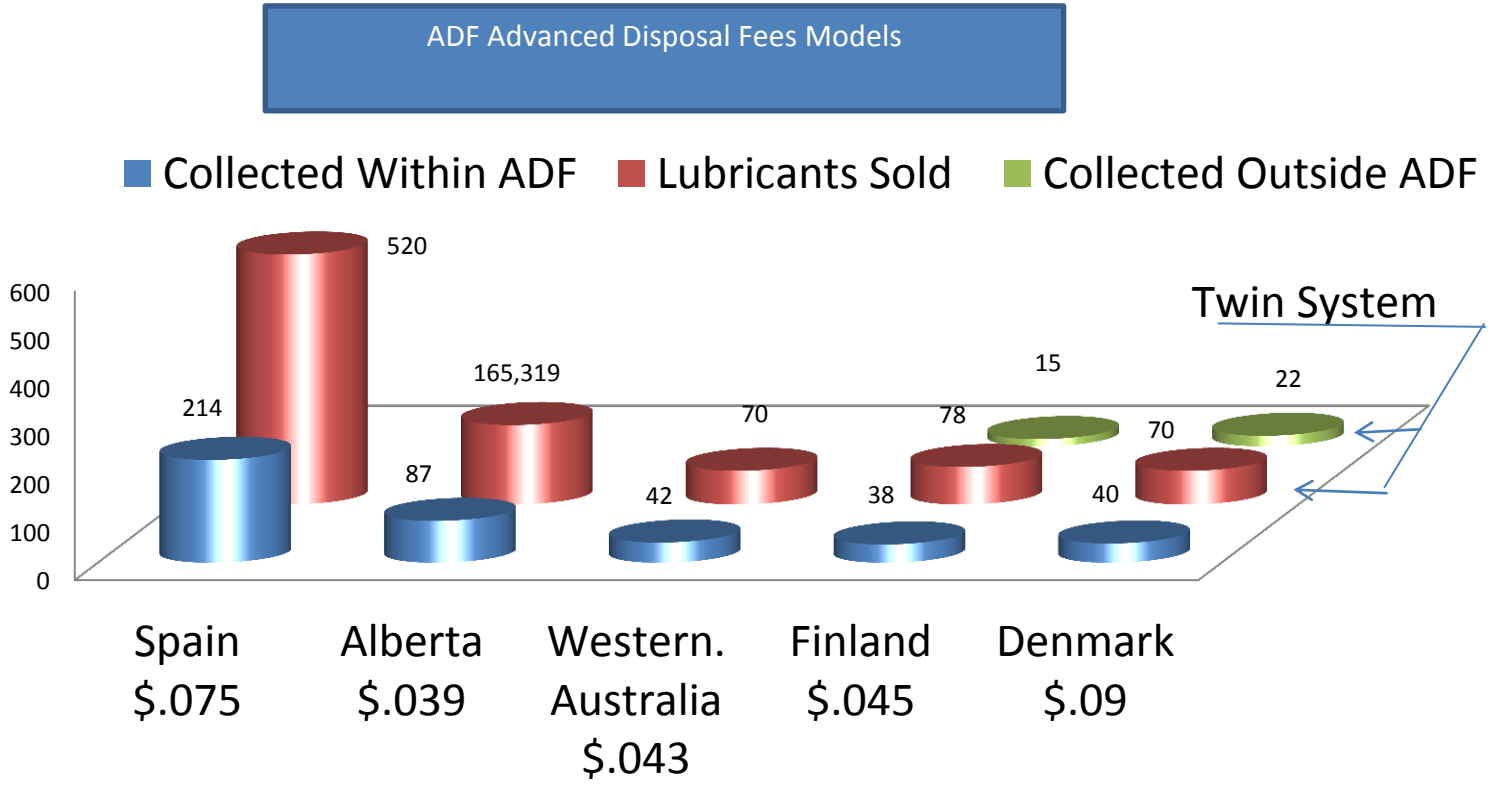


Figure 11: ADF Advanced Disposal Fees Models



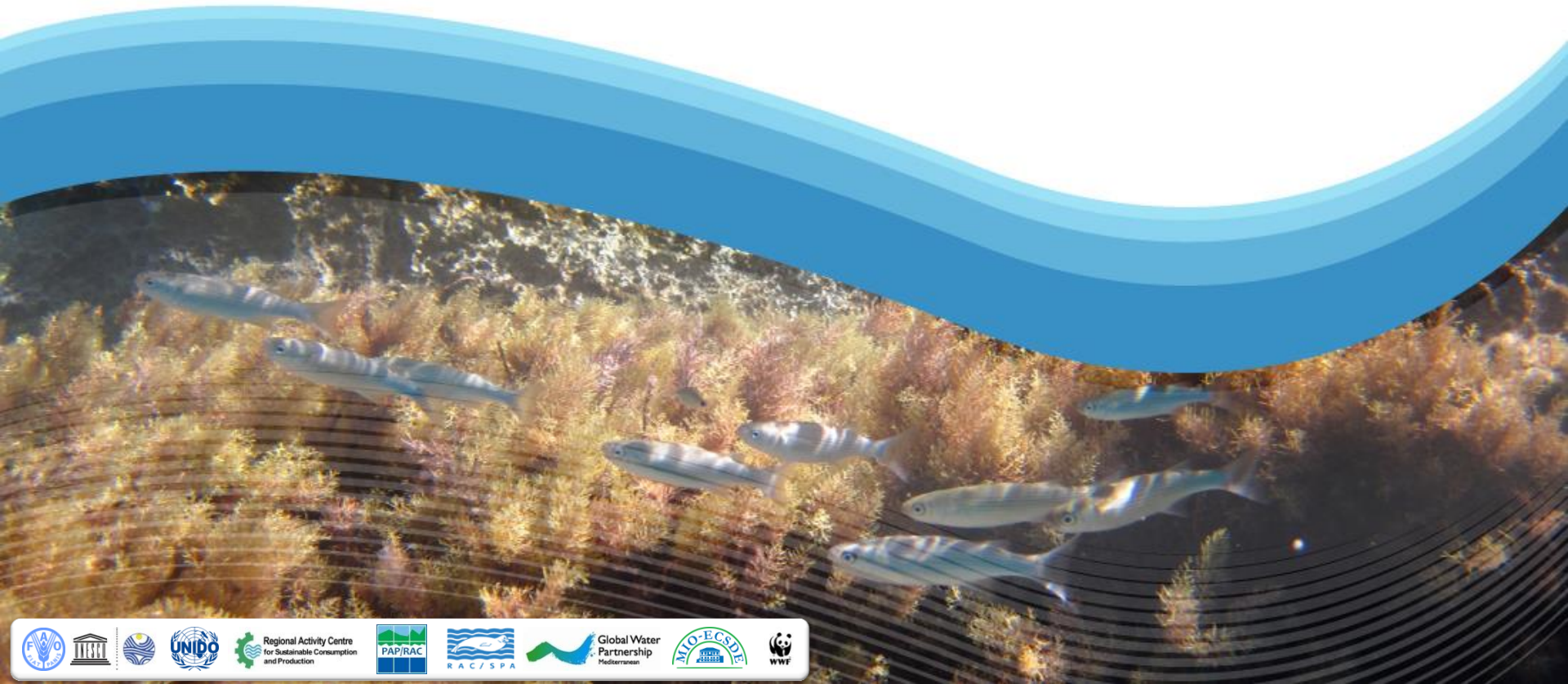
THE STUDY DERIVES FOUR WLOs RECYCLING & MANAGEMENT MODELS

The models are the following:

- 1) Free-Market-System – (UK, Austria, Germany, Greece, Ireland, etc a non-subsidized WLOs recycling scheme);
- 2) State-Interventionist–System-(Denmark, Finland, Spain a subsidized WLOs recycling scheme);
- 3) The Mixed-System –(France, Italy WLOs recycling Scheme); and
- 4) Non-Profit System – (Canada's Alberta province Scheme).

4.4. RESEARCH QUESTION 4

Q4. What technical options are available for the collection and recycling of lubricating oils that meet the requirements of sound environmental standards and international law?



4.4. RESEARCH QUESTION 4

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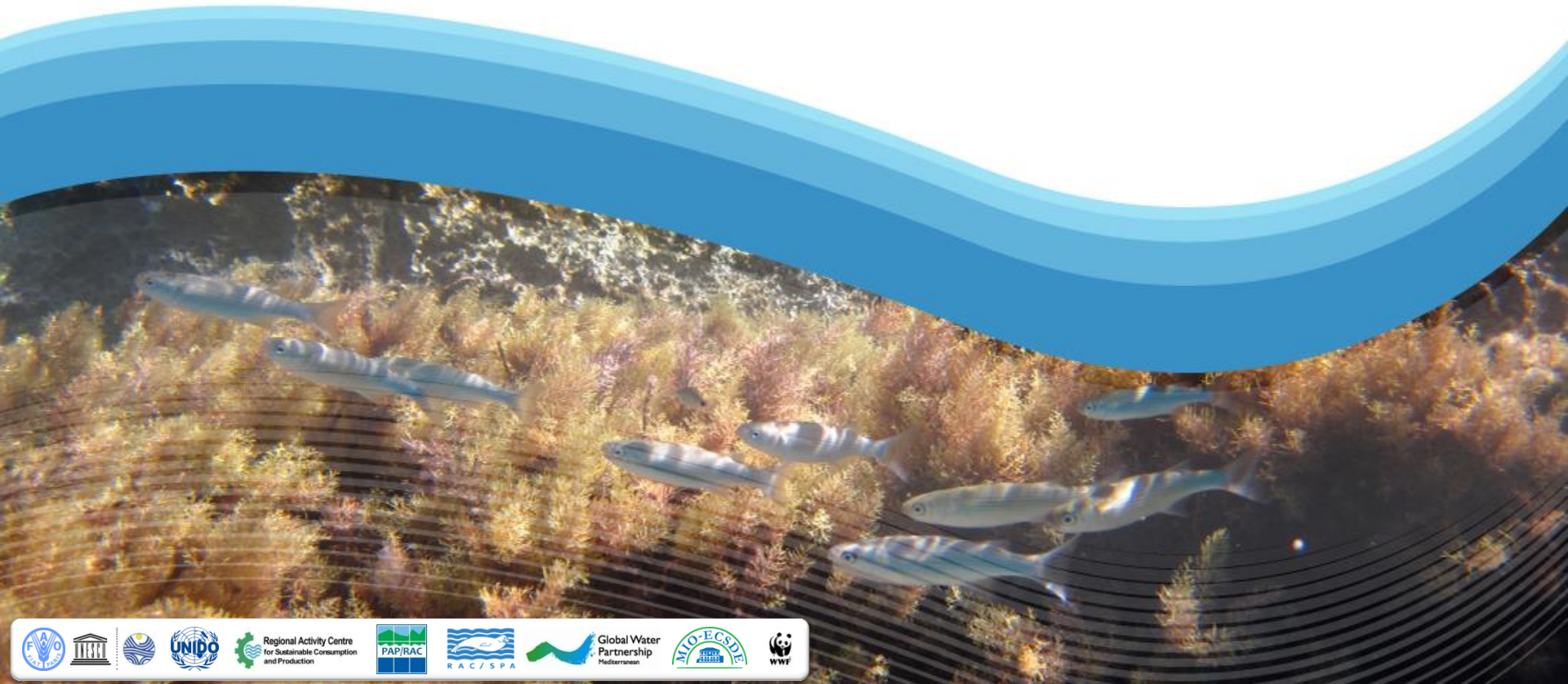
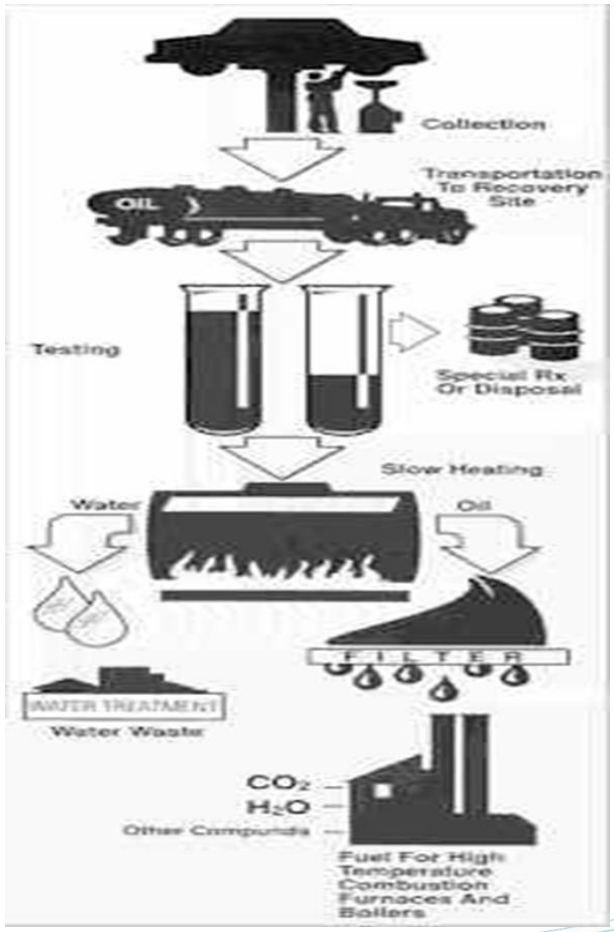


WLOs FROM THE GENERATORS TO THE SYSTEMS FACILITY

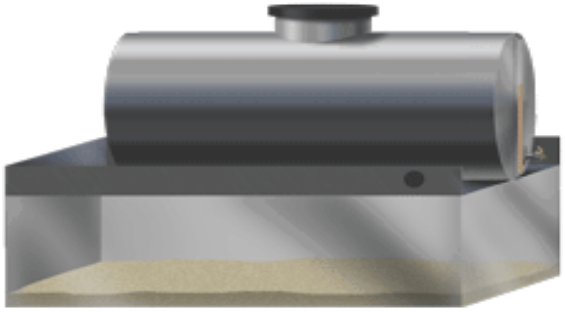


ESPECIAL DESIGNED TRASPORTATION VEHICLES

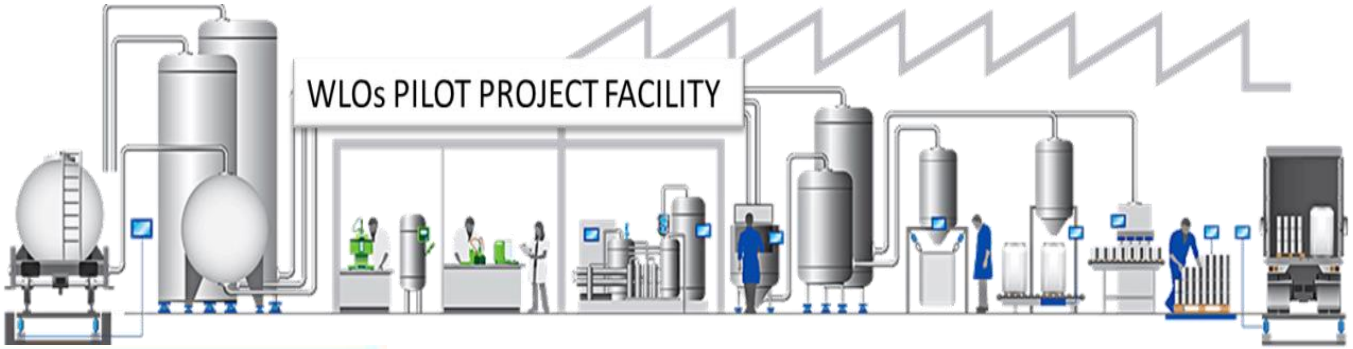
SHORT DISTANANCES & NAROW STREETS AND ENTRANCES

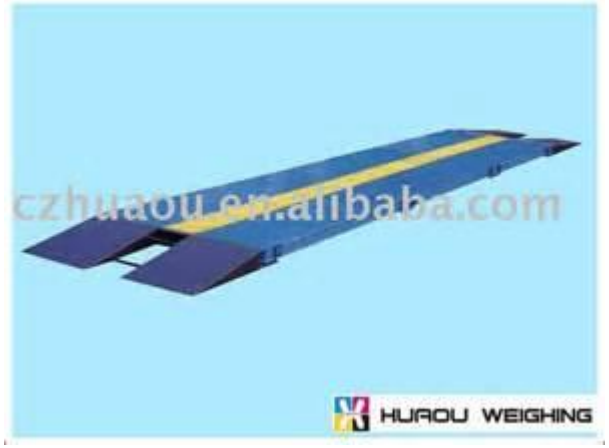
FOR LONG DISTANCES AND HIGHWAYS

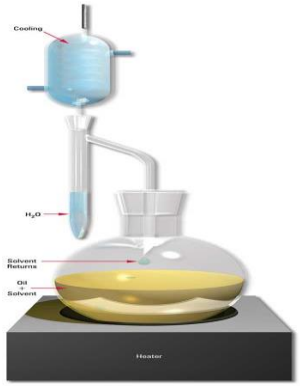
CONTAINERS AND DRUMS

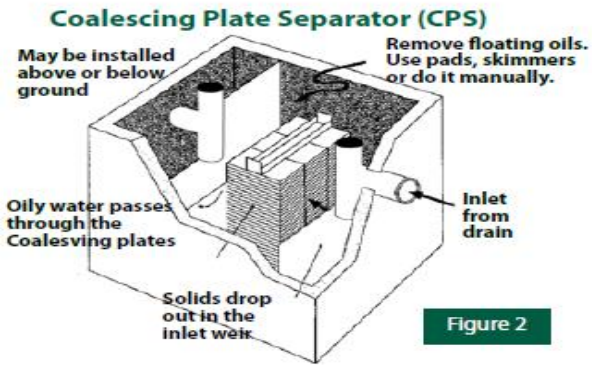


A GENERAL SCENE OF THE PRO THE CESS FROM WITHIN THE FACILITY

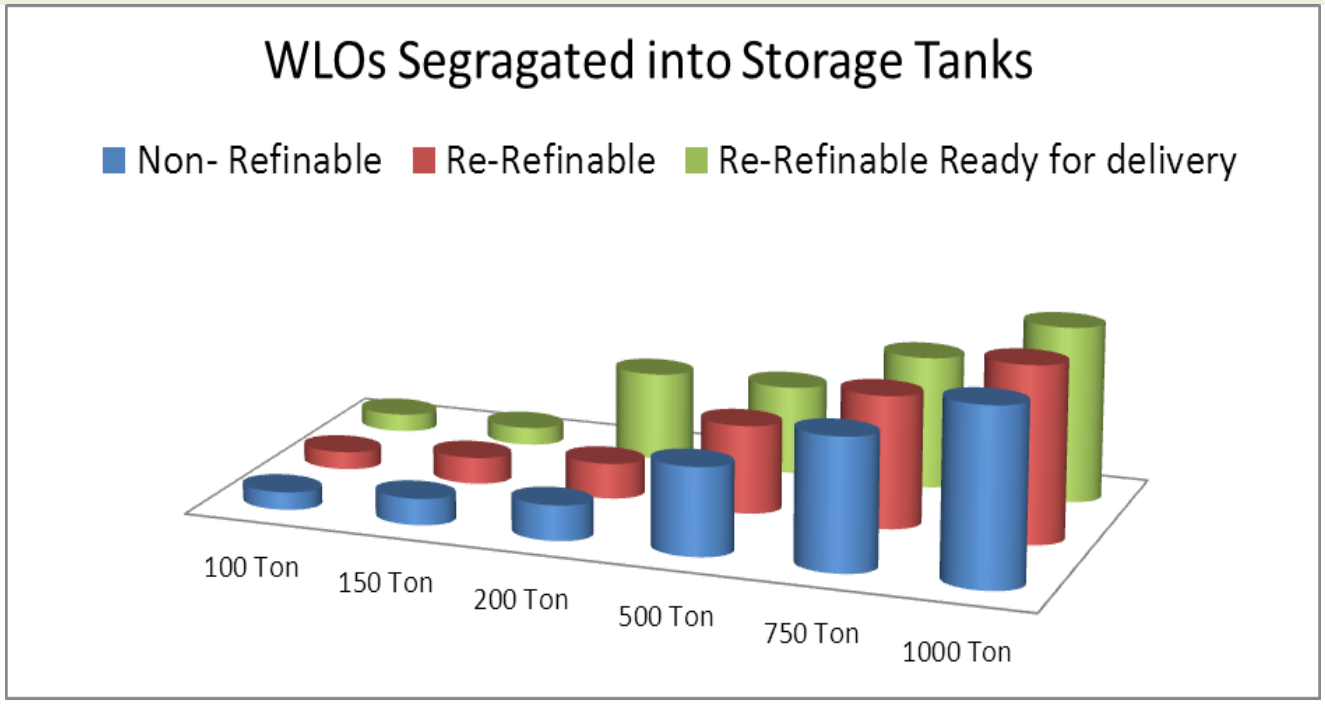




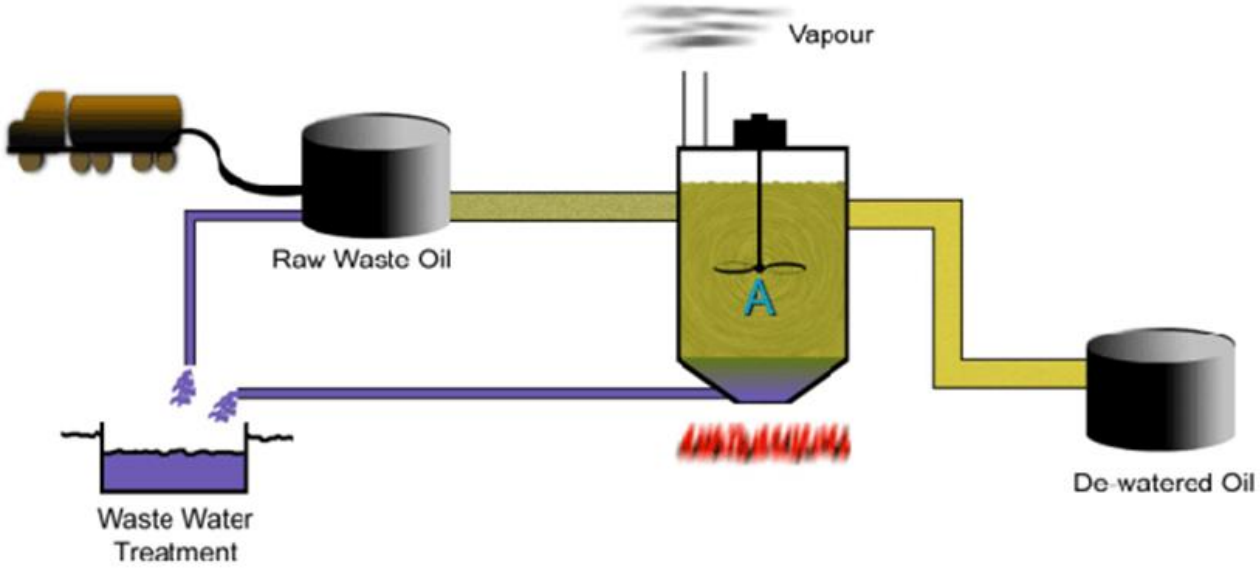




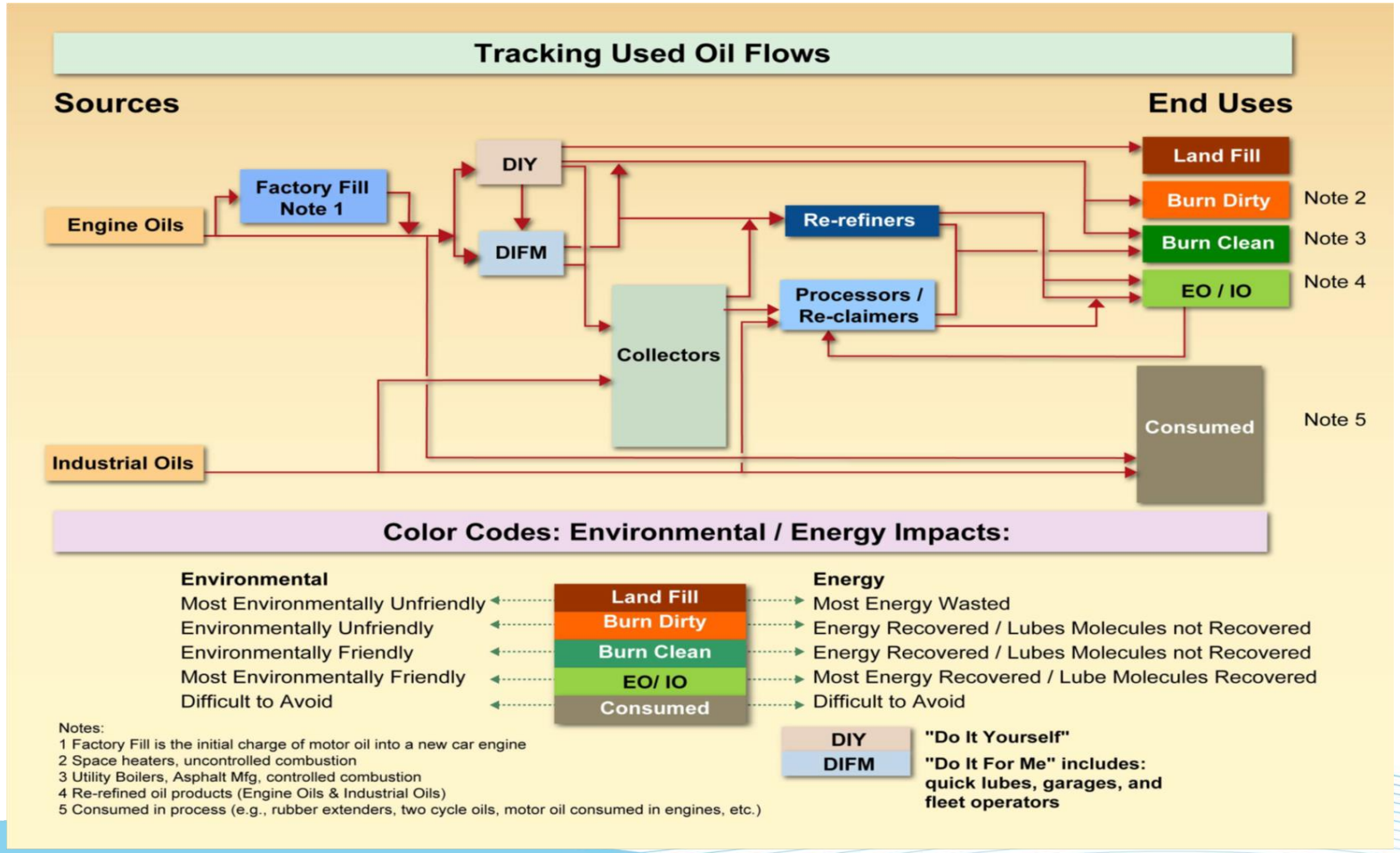
WLOs STORAGE & SEGRAGATION



DIWATERING UNIT USING WOLs for FUEL



COMPUTERIZED SYSTEM TRACKING THE FLOW OF WLOs



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4.5 RESEARCH QUESTION 5

Q5. Question 5: Is an Algerian WLOs Pilot Project Economically Feasible?

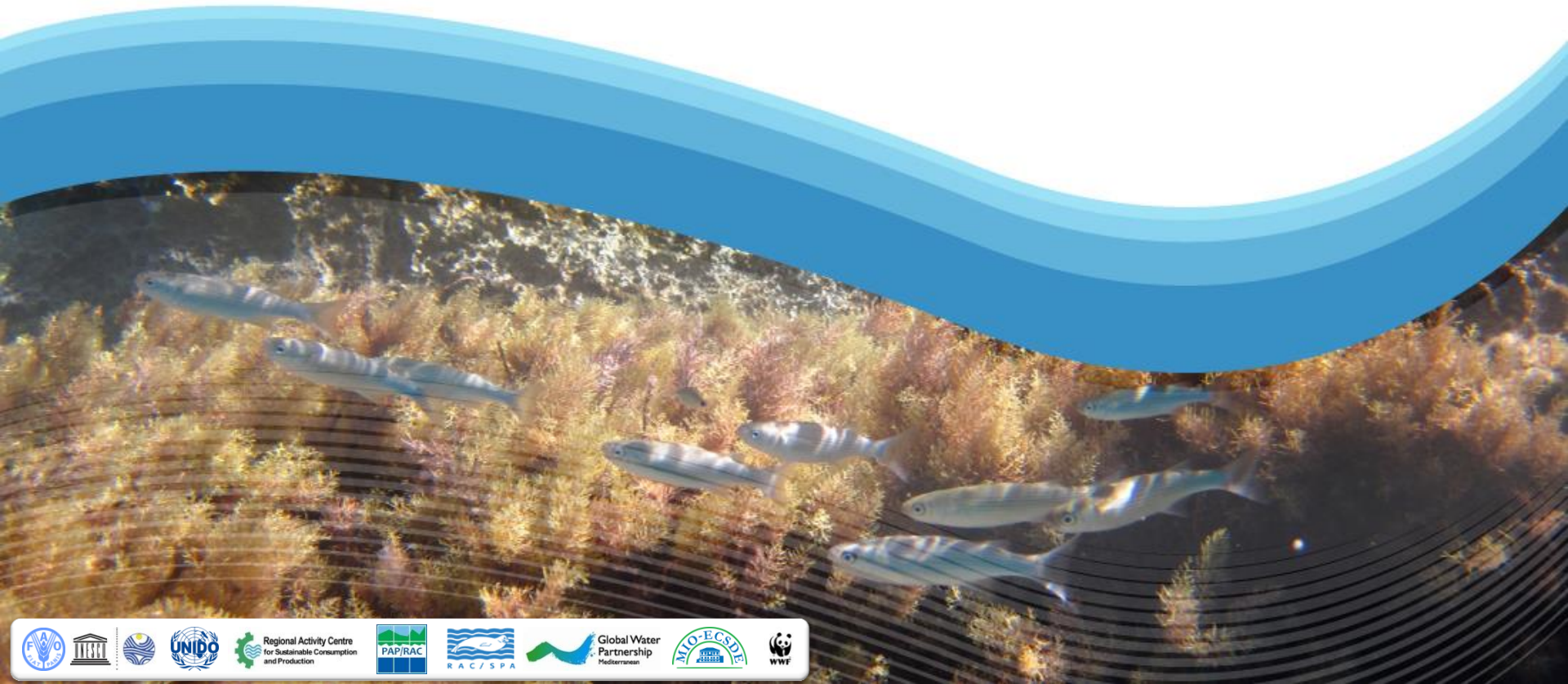

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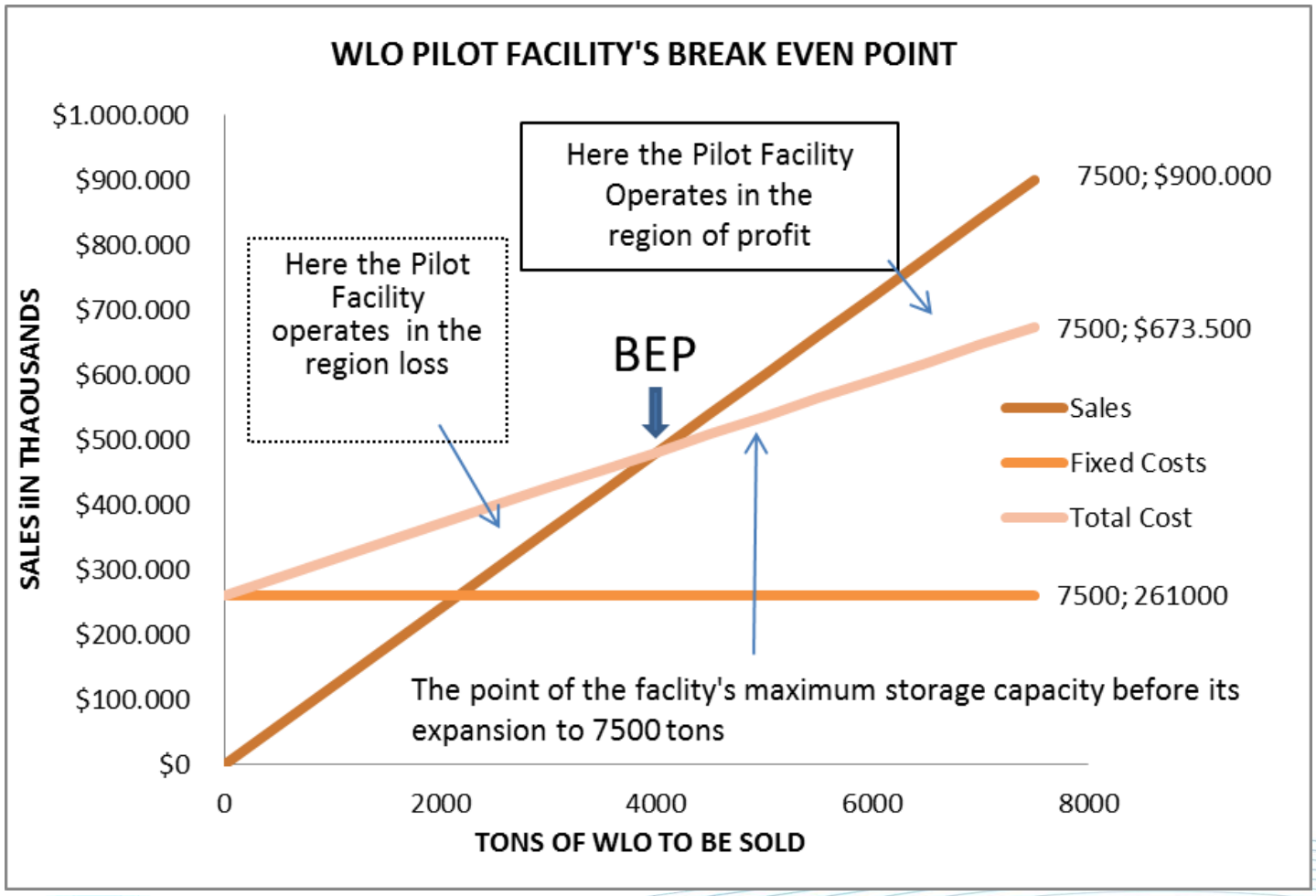
Table 7: Costs of the WLOs Facility

Description	Amount
CAPITAL INVESTMENT	
Total Physical plant cost (land 3000m^2, 1200m^2 building, parking with water drainage & filtering system to keep clean, fences, lights posts, etc.	$600,000
Fixed capital cost (12 tanks 500tons, 5 trucks, 2 weighting scales, 2 tractors, 6 trailers, 6 pumps, 2 fork-lifts, 2 dewatering machines, 1 lire truck, 1 power generator, 1 power washer, 1 mobile crane truck, etc.)	$800,000
Storage containers distributed to WLO generators to keep black & white oils segregated	$150,000
Total investment	$1,550.000
VARIABLE COSTS	
Raw materials usually WLOs from collectors to test their quality & record their source for future references	$150,000
Miscellaneous material	$4,000
Utilities will vary since the facility will take advantage of its own fuel supply to produce its own energy for its operations.	$6,000
Sub total	$160,000
FIXED COSTS	
Maintenance	$15,000
Operating labor is about nine person	$45,000
Laboratory cost	$2,000
Supervision usually consulting fees	$6,000
Plant overheads	$124,000
RND & ongoing storage expansion capital to 7,500 tons capacity	$5,000
Insurance for all truck on the road	$3,500
Promotion Campaign, tv, radio, press, & web hosting,	$61,200
Sub total	$261,200

4.5.2 PROFITABILITY AND PAYBACK PERIOD



MOST LIKELY PRICE SCENARIO

- Now, what if the price of oil was set at $150.00 mark instead of $120.00 per ton which is the most likely scenario?

  5,000 X 150 = 750,000.00 - 536,000.00

  = 214,000.00

- Doing the simple tabulation we get an additional $150,000.00 per year by selling just 5,000 tons. Now this changes everything and the picture looks a bit brighter; and even much brighter if more oil is sold at the same price.

  7,500 tons X $150.00 = ($1,125,000 - $7500,000) = $375,000 gross profit before tax

- With sales at this price the payback period is reduced to less than six years

4.5.5. COST BENEFITS TO SOCIETY AND INDIVIDUAL COLLECTORS

- Algeria's annual productions of waste lube oils are estimated to be at 180,000 tons, and about 130,000 tons are deemed recyclable. Presently only 20,000 tons are recycled per annum. This leaves 110,000 tons of undetermined existence. After processing these quantities and removing water contain and metals more than 90.000 tons can be sold at the international markets for $150.00 per ton. This translates into $135,000,000 (million) of wealth. And, if we divide this number by $10,000 per capita which currently is $7,000 per capita, this gives us a very good annual salary for 1350 people. The Pareto utility principle is fully satisfied because no one is worst off as a result of this project.

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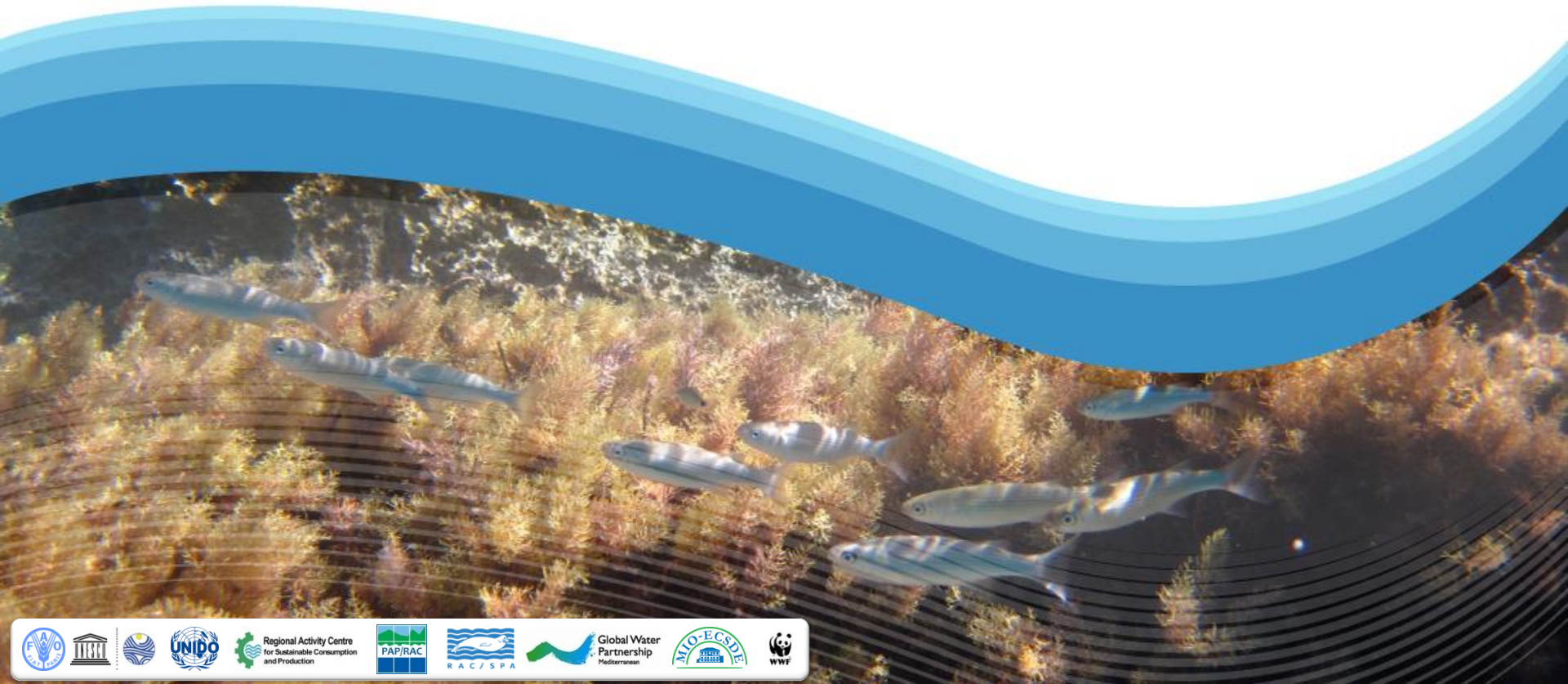
4.6 GENERAL QUESTION 6

Q6. What steps must be taken from now on to speed up the implementation of the pilot project?



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In Time, Emphasis is Shifting From Left to Right as the set of Goals are Fulfilled		
Short Terms Goals (1-2 Years)	**Medium Terms Goals (2-5 Years)**	**Long-Terms Goals (5-10 Years)**
Proper Legislation for Regulation & Enforcement of WLOs Collection Programs; Learn About Accredited Transport		
Secure Real Estate Property in Location for WLOs Storage Facility	Draw Up Schedules For Storage Facility's Infrastructure: Buildings, Tanks & Equipment	Regular Routs for the Same Drivers & Haulers Who Will Gain Experience in Dealings With The WLOs Generators or Suppliers
Set Up Website & Content for Sensitization Program. Invite the Public to REPORT Environmental Risks & Violations from WLOs	Elicit Costs Proposals from Local or International Building Contractors and Assign the Completion of the Project.	Increase Collection from all the Regions and Seek Contributions from NGO
Seek Governmental & 3rd Party Financial Support via Env. Tax for the WLOs Collection & Recycling Project	Purchase a Number of Small & Large ADR Equipped Trucks Needed for the Facility's Own Collection & Transportation Uses	Maintain Sensitization Programs and Target Local Governments to Increase Cooperation and Enforcement WLOs Environmental Laws.
Set Up a Computerized Data Based Information Gathering System for New Lube Oils Demand & WLOs Supply for Each Region	Increase Emphasis on Sensitization Program Targeting All including DIY	Control Burning and Promote Re-refining
Dev. Proper WLOs Management and Segregation Program	Adopt Pricing Structure for Purchasing WLOs from Collectors and Haulers and Begin Operations	Promote Lubricant Consumption from Recycled WOLs in the National Market.
Seek info about Instrument for Quality Control for Water and PCBs Content.	Do the Adjustments in all Spheres of the Operation Continuously Until the system is Perfected	Take a Stock of What Has Been Accomplished so Far, and Decide Whether You Are Ready to Apply the System in The Entire Territory
Other	Other	Other

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4.7 SYSTEMS OBJECTIVES

- The collection system objective is to gather sufficient quantities of waste oil with specific characteristics and quality for ultimate disposal. Consequently, Algiers is considered prime locations for waste lube oil storage and sorting facility. The collection of large quantities of waste lube oil must be sufficient to meet the minimum operating expenses of the organization. The situation in each regional location must be studied and a strategy should be developed to determine the best method of collecting the waste lube oil. The quality of the waste oil collected is also an important consideration. Instruments and processes of quality assurance are necessary aspects of the overall facilities operating procedure and should include quality control guidelines for testing all incoming oils and segregating them if they are not acceptable.