



**PROJECTS → PRODUCTS → WASTE, COMPLEX WASTE  
FROM LINEAR ECONOMY to CIRCULAR ECONOMY:  
*necessity of a better (new) projectual approach***



**Antimo Di Martino**  
*environment and sustainability advisor*



## FROM LINEAR ECONOMY to CIRCULAR ECONOMY

### Linearity and Circularity: present outline of the situation

I would like to introduce my presentation with “the sentence” by Pope Francis by his “Encyclical Laudato si” of last June, about the cure of the earth and the wellness of all, no one excluded:

***“we have not yet managed to adopt a circular pattern of production to ensure resources for all and for future generations, and that requires us to limit the use of non renewable resources, moderate consumption, maximize the efficiency of exploitation, reuse and recycle. Addressing this issue would be a way to counter the culture of waste that ends up hurting the entire planet, but we see that progress in this direction are still very limited”.***

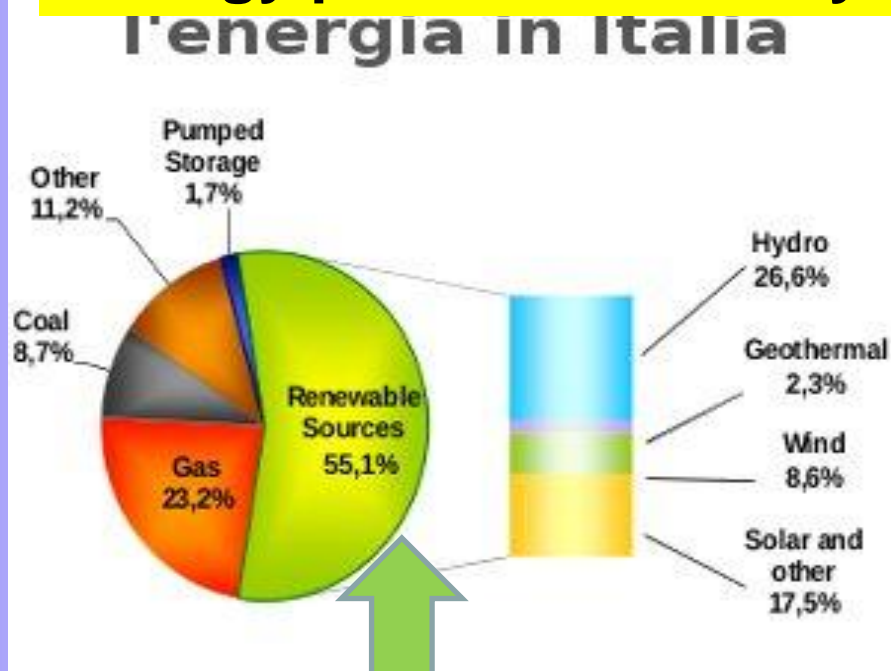
It seems to me, a secular/religious simple and clear analysis<sup>2</sup>!

# FROM LINEAR ECONOMY to CIRCULAR ECONOMY

## Linearity and Circularity: present outline of the situation

Milled asphalt used again in new cycle of road asphalt

### Energy production in Italy



dates: GME report – Administration Energy Italian Market. (May 2014)

Paesi	Conglomerato bituminoso prodotto anno 2013 (t)	Fresato d'asfalto ottenuto dalla rimozione delle pavimentazioni stradali (t)	% di fresato recuperato
Francia	35.400.000	6.900.000	64%
Germania	41.000.000	11.500.000	90%
Spagna	13.300.000	205.000	85%
Olanda	9.700.000	4.500.000	76%
Regno Unito	19.200.000	5.000.000	80%*
Turchia	46.200.000	1.200.000	3%
USA	318.100.000	323.000.000	95%
<b>Italia</b>	<b>22.300.000</b>	<b>10.000.000</b>	<b>20%</b>

(\*) dato stimato

# FROM LINEAR ECONOMY to CIRCULAR ECONOMY

## Linearity and Circularity: present outline of the situation



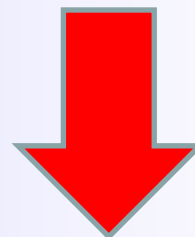
### WG ITALIAN MARITIME MOBILITY

\* contributions's distribution to  
SRA (strategic research agenda)

MEANS OF TRANSPORT: GENERAL (G)	G1: PRODUCTION (from linear to circular economy)	38	20%
	G2: SYSTEM OF SYSTEMS	20	10%
MEANS OF TRANSPORT: FUNCTIONS, SYSTEMS, COMPONENTS (FSC)	FSC1: PRIMARY FSC	67	35%
	FSC2: AUXILIARY FSC	30	15%
	FSC3: USERS' FSC	12	6%
TRANSPORTATION INFRASTRUCTURE (IF)	IF1: HARDWARE FSC	13	7%
	IF2: Intelligent Transport Systems	6	3%
KETs		7	4%

## Linear Economy

### Model of Product's Development



1. Research (serendipity)
2. Experimentation
3. Carrying out/Application
4. Production
5. Used
6. Digest

# WASTE, COMPLEX PRODUCT WASTE :

## present outline of the situation

- **WASTE:** “waste means any substance or object which the holder discards or intends or is required to discard” (directive 2008/98/EC). It isn't waste but “by-product”, every substance or object resulting from a production process, the primary aim of which is not the production of that item but have to respect some determinate conditions. They are displayed in article 5 and article 6 (EoW - end of waste) of the same directive.
- **COMPLEX PRODUCT WASTE :** product reaches the end of life, consisting of various materials from the more difficult recovery; they have, in general, very complex connection systems that do not allow to remove separately the various materials.





# PROJECTS→PRODUCTS→WASTE—COMPLEX WASTE: some example of complex product waste



# FROM LINEAR ECONOMY to CIRCULAR ECONOMY: complex product waste, what they join?

- **End Life Product (usage loss)**
- **Abandoned to ELP (potential)**
- **Environmental pollution (potential)**
- **Wasting of value**
- **Environmental cost**
- **Economic cost**
- **Social cost**
- **Lack of LCA (life cycle assessment) project**
- **Lack of LCC (life cycle cost) evaluation**
- **Lack of DfD (design for disassembling) project**

# FROM LINEAR ECONOMY to CIRCULAR ECONOMY: ELB - specific rules for maritime sector

## **ISO serie 30000 - SHIP RECYCLING:**

[ISO 30000:2009](#) - Specifications for management systems for safe and environmentally sound ship recycling facilities

[ISO 30002:2012](#) - Ships and marine technology - Ship recycling management systems – Guidelines for selection of ship recyclers (and pro forma contract)

[ISO 30003:2009](#) - Ships and marine technology - Ship recycling management systems - Requirements for bodies providing audit and certification of ship recycling management

[ISO 30004:2012](#) - Ships and marine technology - Ship recycling management systems -- Guidelines for the implementation of ISO 30000

[ISO 30005:2012](#) - Ships and marine technology - Ship recycling management systems - Information control for hazardous materials in the manufacturing chain of shipbuilding and ship operations

[ISO 30006:2010](#) - Ship recycling management systems - Diagrams to show the location of hazardous materials onboard ships

[ISO 30007:2010](#) - Ships and marine technology - Measures to prevent asbestos emission and exposure during ship recycling

**UNI** (Ente Nazionale Italiano di Unificazione) **11509/2013**

**SMALL CRAFT**

**SMALL COMMERCIAL VESSEL**

**End of Life Treatment :**

End of Life treatment of small craft, small commercial vessel



# FROM LINEAR ECONOMY to CIRCULAR ECONOMY:

## Linearity and Circularity: present outline of the situation

- **The linear economy is the paradigm of the consumer society:** conception, design, construction, use, consumption, emaciation, product's disposal. It needs to have, always, unlimited resources and also automatically reproduced.
- **The circular economy is defined by the WEF as "Restorative design".** "It is based on the principle that the stocks and flows of resources are reconstructed in opposition to their simple degradation. This results in lower costs and less volatile. **This represents an enormous potential for innovation and the creation of new jobs**".
- **The green economy and the blue economy** are both expression of circular economy.
- The Green economy is more appropriate of the Blue Economy to represent the our technological production processes.

# FROM LINEAR ECONOMY to CIRCULAR ECONOMY: the importance of the DfD draft and of the appropriate methode (the project needs a new approach)

- example of disassembly of boat without DfD project

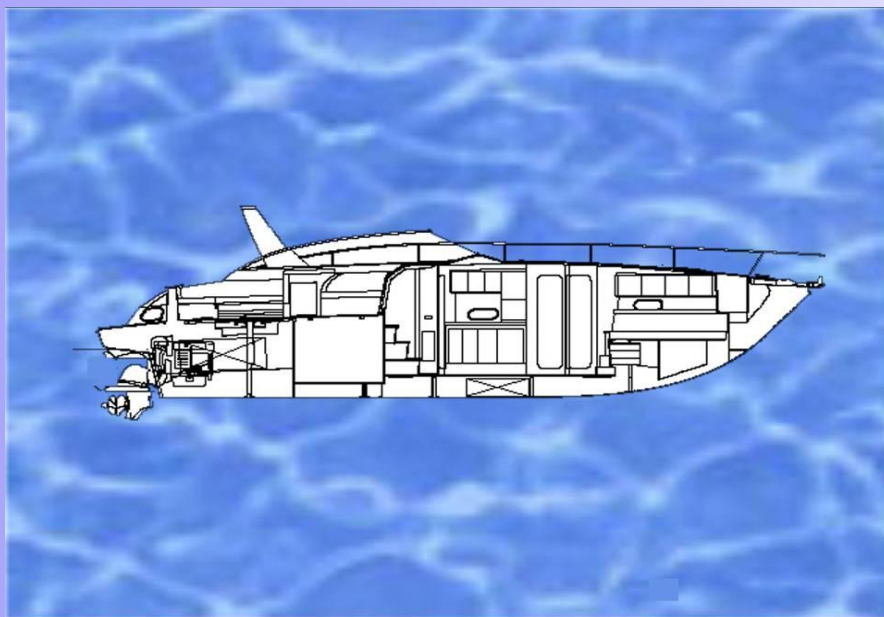


- example of volumetric reduction of a FRP boat



*\*photos by Boat Digest project*

# FROM LINEAR ECONOMY to CIRCULAR ECONOMY: from recreational boating and others, how much waste?



FRP\*

Motors and other

Other materials

Oils and Fuel

Accessories

FRP tot. digested, in Italy (C.E.R.: 070213, 101103, 120105)

- 305,477 Tons (on the 2013) (ECOCERVED dates)
- $\approx$  1,800,000 Tons (by 2008 to 2013) (UCINA valuation)

\*FRP from recr. boats and molds in Italy, (on ELB):  $\approx$ 200,000 Tons (UCINA valuation)

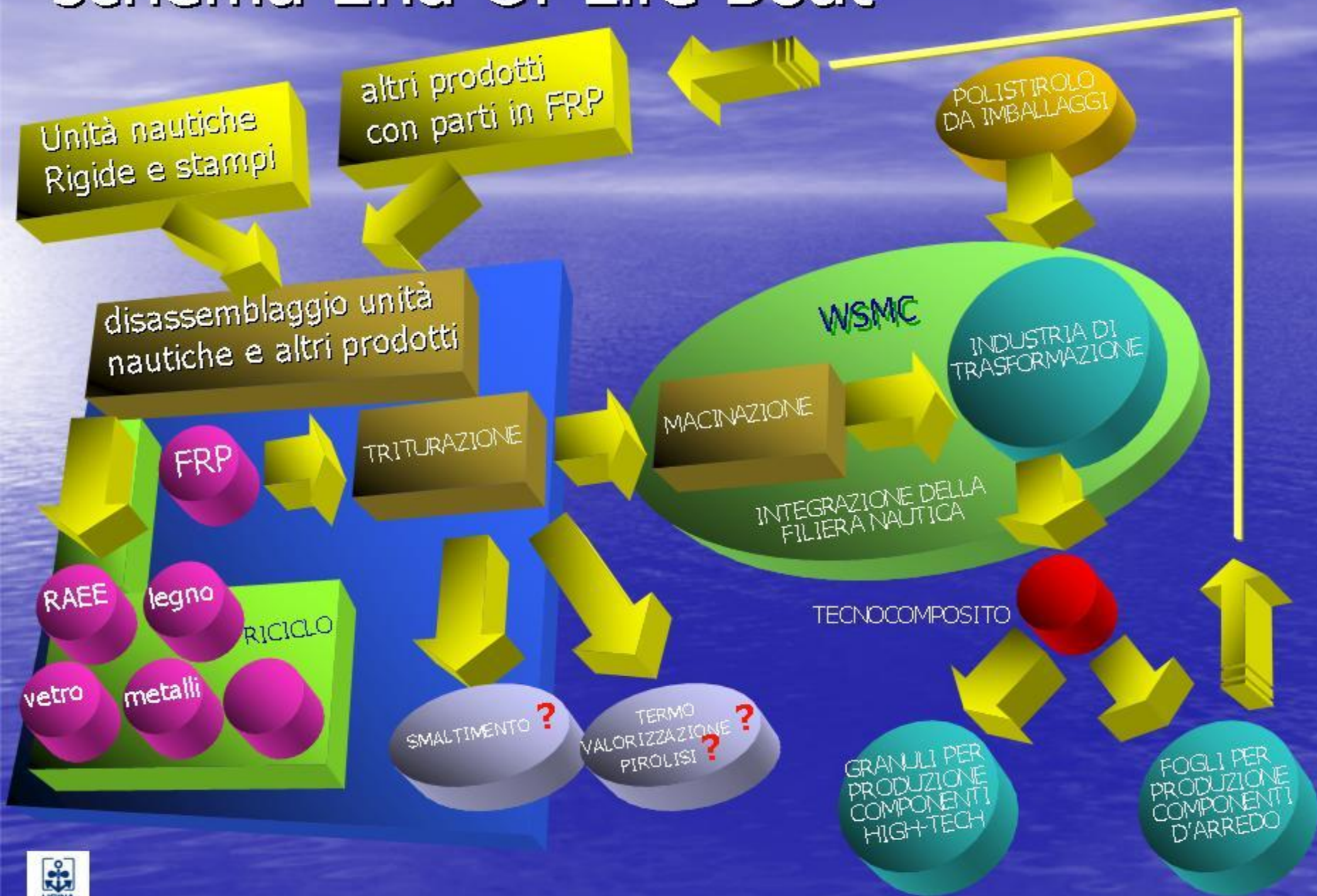


# ELB by UCINA-Confindustria Nautica: Principles and Choices

- **Janez Potočnik** (the former EU Commissioner for the Environment), stated that “the waste is to be considered as a source of secondary raw material that can generate benefits both in environmental and economic terms”.
- **ELB is based on that principle**, expressing the need to regard it as crucial to the success of the project.
- **ELB considered** that the technology of upcycling, open-loop, between FRP and other plastics, developed and tested at the IPCB/CNR by Mario Malinconico and Maurizio Avella, is the most suitable for the treatment of end of life of the FRP.
- **UCINA-Confindustria Nautica and IPCB/CNR** in 2009 signed a specific agreement to develop this and other technologies.



# schema End Of Life Boat





# FROM LINEAR ECONOMY to CIRCULAR ECONOMY: technology for FRP up-cycling (open loop)

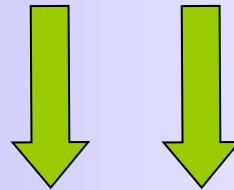
**FRP (fiber reinforced plastic )**



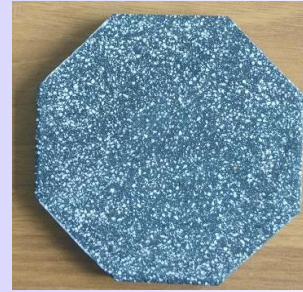
**EPS (polystyrene)**



+



**PELLETS**  
for molding



**SHEETS**  
for furniture or  
flooring

The new compound is a thermoplastic material.  
At the end of the next life cycle it will be recyclable.

# FROM LINEAR ECONOMY to CIRCULAR ECONOMY: some, obtainable materials by up-cycling of waste

FRP + EPS



FRP + EPS + RUBBER



FRP + EPS



FRP + EPS + TEXTILE (by-product)



**UCINA**

CONFINDUSTRIA NAUTICA



# Thanks for your attention

[dimartino@ucina.net](mailto:dimartino@ucina.net)

[ufficiostudi@ucina.net](mailto:ufficiostudi@ucina.net)