POVERE: A TOOL TO CALCULATE SUSTAINABLE FEE FOR PACKAGING PRODUCERS

A. PIRES, R. RIBEIRO, G. MARTINHO, M. MOTA

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

CA3 Computational Intelligence Research Group
UNINOVA Instituto de Desenvolvimento de Novas Tecnologias

WASTES: Solutions, Treatments and Opportunities
2nd International Conference
September 11th – 13th 2013

INTRODUCTION

- Extended producer responsibility (EPR) goals (OECD, 2001):
  - Finance end-of-life costs (relieving municipalities of waste collection and treatment)
  - Provide incentives to producers to reduce materials consumption, use more secondary materials, and promote product design to reduce waste
- EPR packaging – Green Dot System
- Producer fee not capable to reach EPR goals
  - Costs are not fully covered by producer fee (possibly)
  - Packaging consumption has not decoupled from economic growth
  - Environmental aspects considered on fees in rare cases (Netherlands, Norway, Austria, Czech Republic)

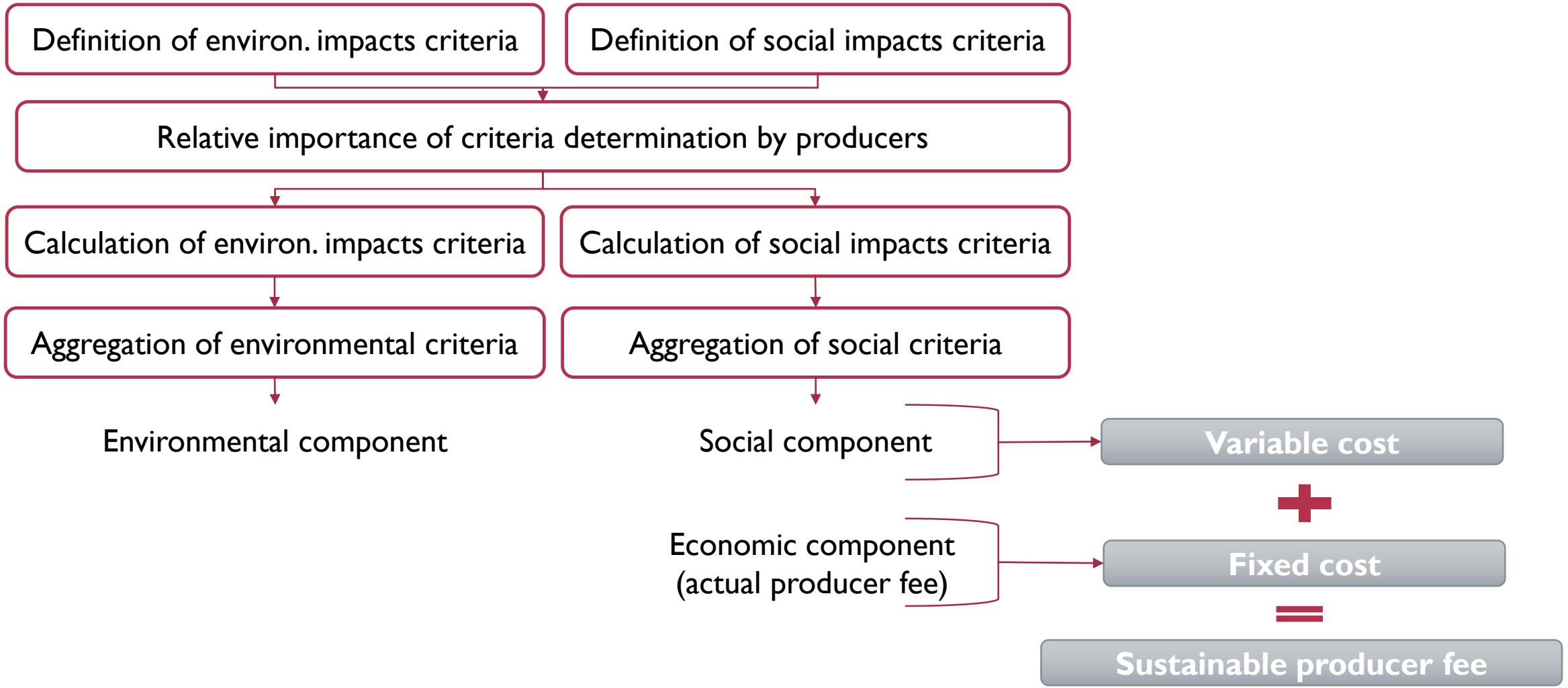
INTRODUCTION (CONT.)

- New method to calculate fee are needed
- Goals of our work:
  - Find a new dynamic formula to calculate producer fee in such way that could promote more sustainable packaging
  - How? Using multicriteria decision making analysis to environmental and social criteria

MATERIAL AND METHODS

- Approach used: Pay-As-You-Throw
  - Fixed component (packaging management costs) + variable component (environmental+social aspects)
- Sustainable producer fee = fixed economic costs + fixed costs x 0.01 x (1 - variable component)
  - Variable component – maximum 1% of fixed costs
- Environmental aspects – life cycle assessment
- Social aspects – environmental education
- Scalling of environmental and social criteria using analytical hierarchy process
- Aggregation of variable component through simple additive method

MATERIAL AND METHODS



CASE STUDY: SOCIEDADE PONTO VERDE

- Sociedade Ponto Verde
- Born in 1996
- Responsible for the end-of-life packaging in Portugal
- Testing: household PET packaging and household HDPE packaging

Plastic packaging	Household primary packaging, includes service bags
Fee (€/tonnes)	200.8

RESULTS

- Environmental and social criteria definition

	Criteria
Environmental criteria	Abiotic depletion resources [kg Sb eq.]
	Acidification [kg SO_2 eq.]
	Eutrophication [kg PO_4^{3-} eq.]
	Global warming [kg CO_2 eq.]
	Human toxicity [kg p-DCB eq.]
	Photochemical oxidation [C_2H_2 eq.]
	Recycled material content [%]
Social criteria	Recycling container label ["0" no label;"1" presence of label]
	Recycled content label ["0" no label;"1" presence of label]
	Carbon footprint information ["0" no label;"1" presence of label]
	Trash can label ["0" no label;"1" presence of label]
	Absence of information ["0" presence of information;"1" absence of information]

RESULTS (CONT.)

- Relative importance of criteria determination by packaging producers

Criteria	Weights	λ_{max}, CI, RI, CR	Values
Abiotic depletion	0.065	λ_{max}	13.010
Acidification	0.061	CI	0.0918
Eutrophication	0.058	RI	1.54
Global warming	0.111	CR	0.06
Human toxicity	0.075		
Photochemical oxidation	0.054		
Recycled material content	0.123		
Recycling label	0.140		
Recycled material label	0.101		
Carbon footprint label	0.105		
Trash can	0.061		
Absence of information	0.045		

RESULTS (CONT.)

- Criteria calculation

Criteria	Packaging	
	PET	HDPE
Abiotic depletion resources [kg Sb eq.]	1.1	3.3
Acidification [kg SO_2 eq.]	0.7	1.6
Eutrophication [kg PO_4^{3-} eq.]	0.1	0.1
Global warming [kg CO_2 eq.]	148.9	349.5
Human toxicity [kg p-DCB eq.]	7.4	64.6
Photochemical oxidation [C_2H_2 eq.]	0.0	0.1
Recycled material content [%]	5	20
Recycling container label ["0" no label;"1" presence of label]	0	1
Recycled content label ["0" no label;"1" presence of label]	0	1
Carbon footprint information ["0" no label;"1" presence of label]	1	1
Trash can label ["0" no label;"1" presence of label]	1	0
Absence of information ["0" presence of information;"1" absence of information]	0	0

RESULTS (CONT.)

- Aggregation and sustainable producer fee calculation

Criteria	Results		Sensitivity analysis	
	PET	HDPE	PET	HDPE
Environmental component	0.425	0.123	0.319	0.144
Social component	0.166	0.240	0.166	0.240
Variable component (SAW results)	*0.591*	*0.363*	*0.485*	*0.385*
Fixed component [€/t]	*200.8*	*200.8*	*200.8*	*200.8*
Sustainable producer fee eq. [€/t]	201.620	202.078	201.834	202.036
Variation to actual producer fee [€/t]	0.820	1.278	1.034	1.236
Variation between packaging [€/t]		0.458		0.202

CONCLUSION

- Formula calculates a sustainable, differentiated producer fee
- Reflects directly to packaging producers the extra (variable amount) and why it changes
- Other aggregation methods to be tested
- Other factors which could affect variable component will be studied

ACKNOWLEDGE

sociedade ponto verde

FCT FACULDADE DE CIÊNCIAS E TECNOLOGIA UNIVERSIDADE NOVA DE LISBOA

CA3 Computational Intelligence Research Group

UNINOVA Instituto de Desenvolvimento de Novas Tecnologias

Thank you!

Contact: alp11931@fct.unl.pt