

“Socioeconomic evaluation of the mosquito management plans: a holistic approach of citizens and experts”

**Antonios Kolimenakis
(Economic Researcher)**

**Institute of Urban Environment & Human
Resources (UEHR)
Panteion University**

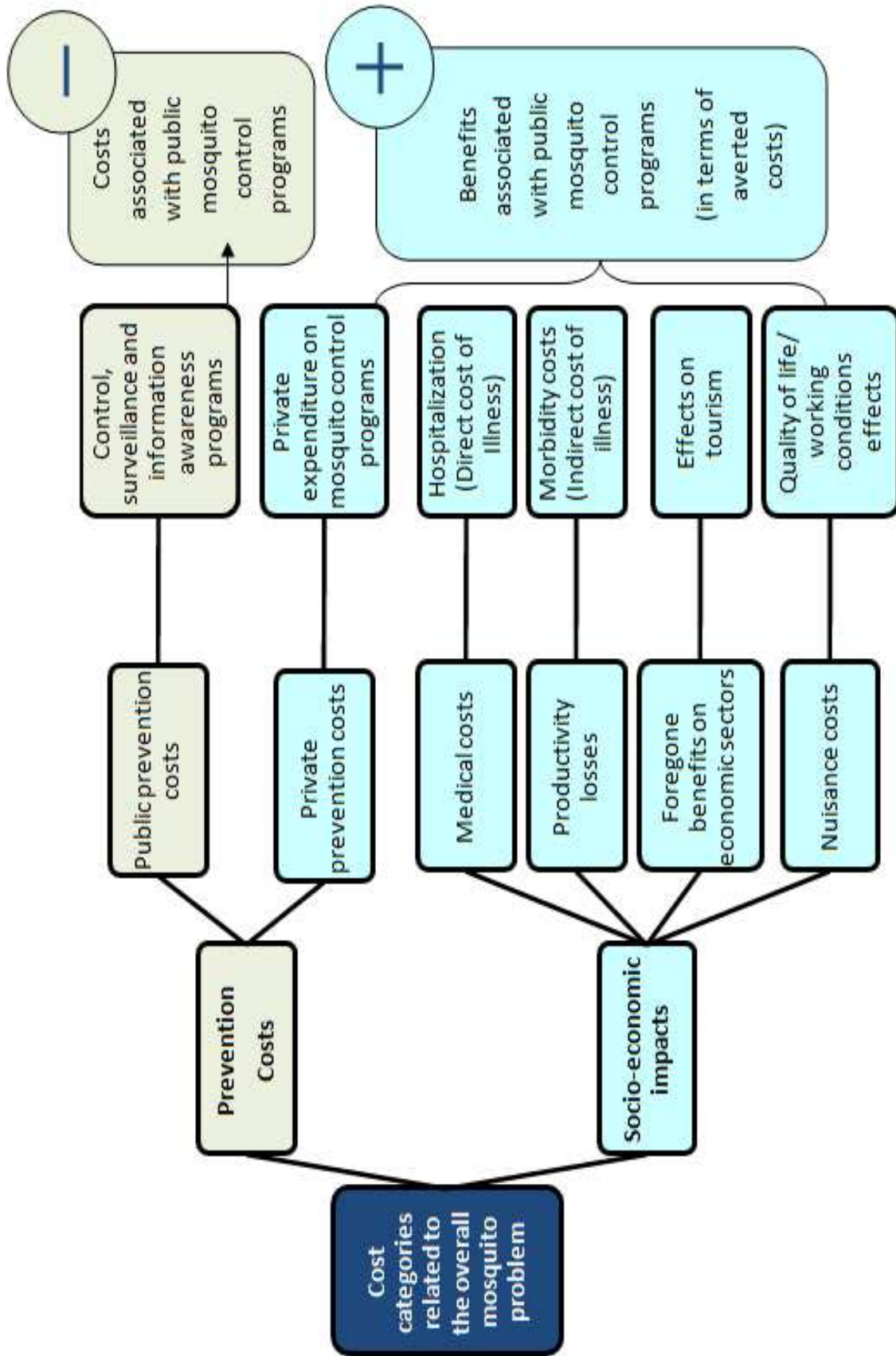


Introduction

- **Climate change, Globalization & Urbanization** favour the spread of new invasive species & infectious diseases in S. Europe
- Intensified problem of Invasive Mosquito Species in the Mediterranean area since 2000
- Associated socioeconomic consequences become more complex and hard to evaluate



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Basic Economic Figures

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Average Annual Public Mosquito Control Costs for the Athens Metropolitan Area 2015	1.300.000 €
Average Annual Public Aedes albopictus Control Costs for the Emilia-Romagna Area 2015	3.316.636 € (mean total expenditure in 2012-2015)
Cost of Public Programs per household/year Athens	0.9 €
Cost of Public Programs per inhabitant/year Emilia-Romagna	0.83 € (mean total expenditure per inhabitant in 2012-2015)
Actual Private mosquito prevention cost/ household / year (Athens Area)	26.4 €
Actual Private Aedes albopictus prevention cost/ household / year (Emilia Romagna Area)	48.11 € (sample mean); 26.11 € (sample median)
Benefits (avr) from improved public control programs per household/year Athens (WTP)	From 2.59 € to 14.88 €
Aggregate Benefits from improved public control programs (Athens area)	From 4.100.00€ to 21.096.805 €



Target of the present analysis

- Appraise the socioeconomic costs & benefits of mosquito control from a citizens' and stakeholders'-experts' perspective
- Evaluate the socioeconomic aspects of the problem from a holistic- ecosystemic view



Why a holistic approach?

Various social and ecological processes, such as extreme poverty, population movements, urbanization, and deforestation, favor the emergence and resurgence of infectious syndromes and diseases and increase their epidemiological complexity



Why a holistic approach?

Inclusion of various groups and their interests in the decision-making, taking into account the systemic interconnectedness over humans and ecosystems



Methods

- Cost of illness study on mosquito related health costs in Greece (West Nile Virus & Malaria); 2013-2014
- Use of Choice Experiment (CE) Method (495 responses in the Athens area) to evaluate benefit of improved prevention measures; 2015-2016

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Methods

- Web based questionnaire on the qualitative impacts of the Asian tiger mosquito in Greek households (1220 responses); 2016-2017
- Experts' qualitative survey on the effectiveness of mosquito control programs in Italy and Greece (apr. 90 responses); 2016-2017
- Italian survey on private household costs(details to be presented later on)



Priority for mosquito control (IT)

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	Reduce epidemic risk	Reduce the risk of introduction of new species of mosquito	Reduce the degree of harmfulness of mosquitoes	Reduce the presence of Aedes albopictus
	It is a consequence of the actions that follow	1	-	1
PUBLIC HEALTH SERVICE of FERRARA	4	3	5	1
PUBLIC HEALTH SERVICE of IMOLA	1	doable?	3	2
PUBLIC HEALTH SERVICE of MODENA	-	-	-	-
PUBLIC HEALTH SERVICE of PARMA	2	1	2	1
PUBLIC HEALTH SERVICE of PIACENZA	1	3	2	3
PUBLIC HEALTH SERVICE of RIMINI	1	1	4	2
PUBLIC HEALTH SERVICE of ROMAGNA (CESENA)	1	2	3	-
MUNICIPAL ENVIRONMENT SERVICE of ARGENTA	3	5	2	4
MUNICIPAL ENVIRONMENT SERVICE of BOLOGNA	1	5	3	2
MUNICIPAL ENVIRONMENT SERVICE of BONDENO	1	-	-	-
MUNICIPAL ENVIRONMENT SERVICE of CASTEL SAN GIOVANNI	1	2	3	4
MUNICIPAL ENVIRONMENT SERVICE of CATTOLICA	1	4	5	2
MUNICIPAL ENVIRONMENT SERVICE of CERVIA	1	2	5	3
MUNICIPAL ENVIRONMENT SERVICE of CESENA	2	3	5	1
MUNICIPAL ENVIRONMENT SERVICE of CORREGGIO	1	5	2	2
MUNICIPAL ENVIRONMENT SERVICE of FORLI'	1	2	3	4
MUNICIPAL ENVIRONMENT SERVICE of FORLIMPOPOLI	2	5	1	3
MUNICIPAL ENVIRONMENT SERVICE of GAMBETTOLA	1	2	2	1
MUNICIPAL ENVIRONMENT SERVICE of MODENA	1	1	2	3
MUNICIPAL ENVIRONMENT SERVICE of PARMA	5	4	2	1
MUNICIPAL ENVIRONMENT SERVICE of PIACENZA	3	4	2	1
MUNICIPAL ENVIRONMENT SERVICE of RIMINI	1	1	-	1
MUNICIPAL ENVIRONMENT SERVICE of UNIONE BASSA ROMAGNA				



Environmental Impacts of mosquito control (IT)

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	Yes	No	I do not know
PUBLIC HEALTH SERVICE of FERRARA	X	-	-
PUBLIC HEALTH SERVICE of IMOLA	-	X	-
PUBLIC HEALTH SERVICE of MODENA	-	X	-
PUBLIC HEALTH SERVICE of PARMA	X	-	-
PUBLIC HEALTH SERVICE of PIACENZA	-	X	-
PUBLIC HEALTH SERVICE of RIMINI	X	-	-
PUBLIC HEALTH SERVICE of ROMAGNA (CESENA)	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of ARGENTA	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of BOLOGNA	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of BONDENO	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of CASTEL SAN GIOVANNI	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of CATTOLICA	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of CERVIA	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of CESENA	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of CORREGGIO	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of FORLI'	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of FORLIMPOPOLI	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of GAMBETTOLA	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of MODENA	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of PARMA	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of PIACENZA	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of RIMINI	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of UNIONE BASSA ROMAGNA	X	-	-



Extra Funding Sources (IT)

		question 18			
		State contribution	Redistribution of resources at the regional level	Imposing order tax	Real obligation to take charge of the activities by the private
PUBLIC HEALTH SERVICE of FERRARA		-	-	X	-
PUBLIC HEALTH SERVICE of IMOLA		-	-	X	X
PUBLIC HEALTH SERVICE of MODENA		-	-	-	-
PUBLIC HEALTH SERVICE of PARMA		X	X	-	-
PUBLIC HEALTH SERVICE of PIACENZA		-	-	X	X
PUBLIC HEALTH SERVICE of RIMINI		X	-	-	-
PUBLIC HEALTH SERVICE of ROMAGNA (CESENA)		X	-	X	X
MUNICIPAL ENVIRONMENT SERVICE of ARGENTA		-	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of BOLOGNA		I have no clear idea about			
MUNICIPAL ENVIRONMENT SERVICE of BONDENO		-	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of CASTEL SAN GIOVANNI		X	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of CATTOLICA		X	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of CERVIA		-	X	X	-
MUNICIPAL ENVIRONMENT SERVICE of CESENA		-	-	X	-
MUNICIPAL ENVIRONMENT SERVICE of CORREGGIO		X	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of FORLI'		-	X	X	-
MUNICIPAL ENVIRONMENT SERVICE of FORLIMPOPOLI		X	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of GAMBETTOLA		X	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of MODENA		-	-	-	X
MUNICIPAL ENVIRONMENT SERVICE of PARMA		X	X	X	X
MUNICIPAL ENVIRONMENT SERVICE of PIACENZA		-	X	-	X
MUNICIPAL ENVIRONMENT SERVICE of RIMINI		-	X	-	-
MUNICIPAL ENVIRONMENT SERVICE of UNIONE BASSA ROMAGNA		X	X	-	X

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Stakeholders' Survey (GR)

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	Reduction of mosquito-borne diseases		Reduction of nuisance	
	from native species	from invasive species	from native species	from invasive species
Highly important	63%	30%	4%	0%
Important	32%	57%	7%	3%
Neutral	3%	7%	65%	12%
Less important	1%	3%	7%	62%
Not important	0%	3%	4%	24%



Stakeholders' Survey (GR)

- **Environmental Consequences from Mosquito Control:**
 - No: 64%
 - Yes: 24%
 - I do not know: 12%

Stakeholders' Survey (GR)

Extra Funding Sources for Mosquito Control:

- Redistribution of Annual State's Budget: 50%
- Redistribution of Annual Regional/Municipal Budget: 37%
- Redistribution of Funds from other Regional/Municipal Activities: 22%
- Imposing special taxes to Citizens: 10%
- Obligation of citizens to uptake the costs and activities/spraying in private properties: 53%



Individuals' rating of the objectives of mosquito control programs (GR web survey results)

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	Reduction of mosquito-borne disease risks		Reduction of nuisance		Low cost to households
	From native species	From invasive species	From native species	From invasive species	From future control programs
Highly important	73.2%	76.7%	47.1%	39.5%	26.8%
Important	19.1%	15.9%	32.3%	25.3%	17.8%
Neutral	5.4%	5.6%	15.7%	20.2%	26.5%
Less important	1.6%	1.2%	4.0%	10.3%	17.4%
Non important	0.7%	0.6%	0.9%	4.7%	11.6%



Web survey results (GR)

- Citizens appear to be sensitive to the environmental consequences associated with the mosquito abatement methods
-but have difficulty in identifying the environmental consequences of mosquito control methods



Web survey results (GR)

- Citizens perceive the protection from mosquito-borne diseases as an important public good which should be funded by public expenses
- Citizens' participation is also highly important especially in the monitoring and control of invasive mosquito species



Web survey results

- The fact that climate change trends and threat of new diseases (e.g. Zika virus), make the prevention and control methods even more sophisticated

increase even more the complexity of citizens' participation and the associated dilemmas (e.g. human health versus environmental consequences)



Conclusions from the Web & Stakeholder Surveys

- Health Impacts recorded as more important than nuisance impacts in Greek case
- Harmfulness of mosquitoes recorded as most important for Italian Stakeholders
- Diseases from invasive species considered a serious threat in both cases

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Conclusions from the Web & Stakeholder Surveys

- Stakeholders and Citizens are aware of the environmental consequences of control methods
- Greek Citizens are prone to consider public authorities as responsible for the health protection
- Citizens seem to transfer the responsibility of health protection onto experts and public health practitioners



An ecosystem approach

- An ecosystem approach to preventing infectious diseases considers drivers of risk in terms of the ***ecological, social, cultural, political,*** and ***economic*** factors of transmission dynamics
- Climate change, globalization & urbanization make the issue even more complex

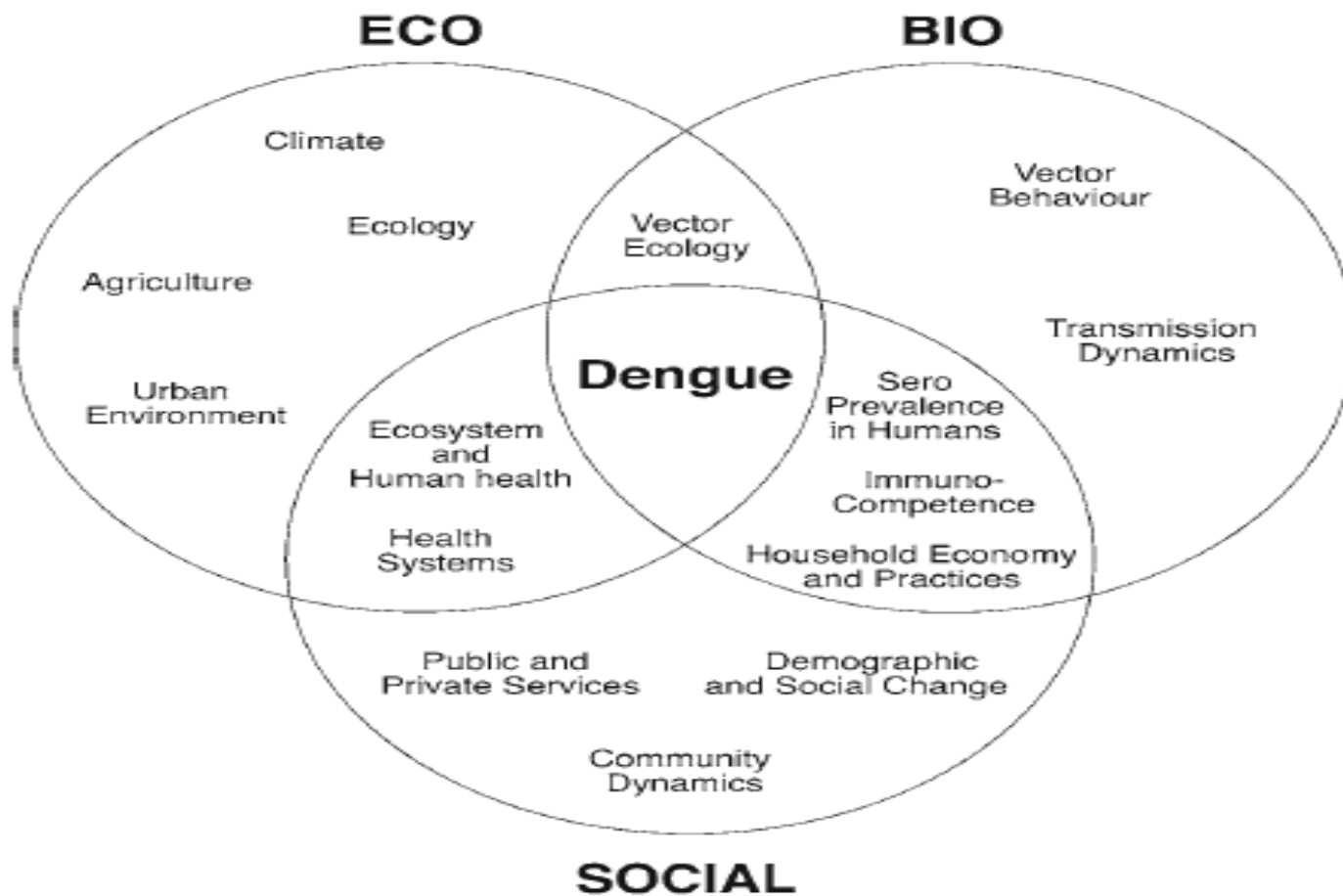


Ecosystemic factors

- Transmission of infectious diseases is linked to interactions among several factors:
demographic changes, poverty, urbanization, deforestation, changes in agriculture models of production, changed relationships between people and animals, natural resources management, and gender differences and cultural patterns



Example of a ECO-BIO-SOCIAL framework



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Source: Tana, Susilowati, et al. "Eco-Bio-Social research on dengue in Asia: general principles and a case study from Indonesia." *Ecohealth research in practice*. Springer New York, 2012. 173-184.



Institutional approaches of mosquito control

	TECHNICAL APPROACH	HOLISTIC APPROACH
<i>Orientation</i>	Solutions for adaptation to man-made challenges (e.g. Climate Change & Urbanization)	Examination of causes leading to man-made challenges (e.g. Climate Change & Urbanization)
<i>Focus</i>	Impacts on Humans' Quality of Life	Impacts on Ecosystems
<i>Objectives</i>	Reduction in the Number of Disease Cases	Preservation of human health as part of the Ecosystems' Equilibrium
<i>Means</i>	Technology oriented solutions	Inclusive decisioning
<i>Economic Approach</i>	Cost-Benefit investment based Solutions	Allocation of resources according to socio-ecological targets and boundaries

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Further Research Challenges

- Challenge; to incorporate ecosystemic factors into risk anticipation, modeling future scenarios, prevention, and health promotion
- Challenge; to upgrade the information level of EU & National Authorities also from an ecosystemic perspective
- Bridge the gaps between “system”, “society”, “health”, and “ecology”



Thank you for your attention!

ANTONIOS KOLIMENAKIS:

Institute of Urban Environment and Human Resources (UEHR)

Panteion University, Athens, Greece

+30 2109247450

akolimenakis@gmail.com, uehr@panteion.gr

www.uehr.gr

www.eesd.gr

LIFE CONOPS (LIFE12 ENV/GR/000466)



University Research Institute
urban
environment
human
resources Panteion University, Athens

