

The contribution of mining industry to the management of abandoned mines

Panagiotis Tsakiris

PhD. Candidate

National Technical University of Athens

mmpospt@central.ntua

Current business environment for Mining Industry

Mining industry, due to the nature of the activities, produces a huge volume of hazardous waste

- Communities' mistrust against mining sector
 - New mining investments encounter many difficulties
- Instability at the regulatory framework
 - Existing projects face viability problem

Proposed EU Directives on:

- * environmental liability (COM-17 2002), and
 - * management of waste from extractive industries (COM-319 2003)
- establish common principles for environmental conservation within the European zone

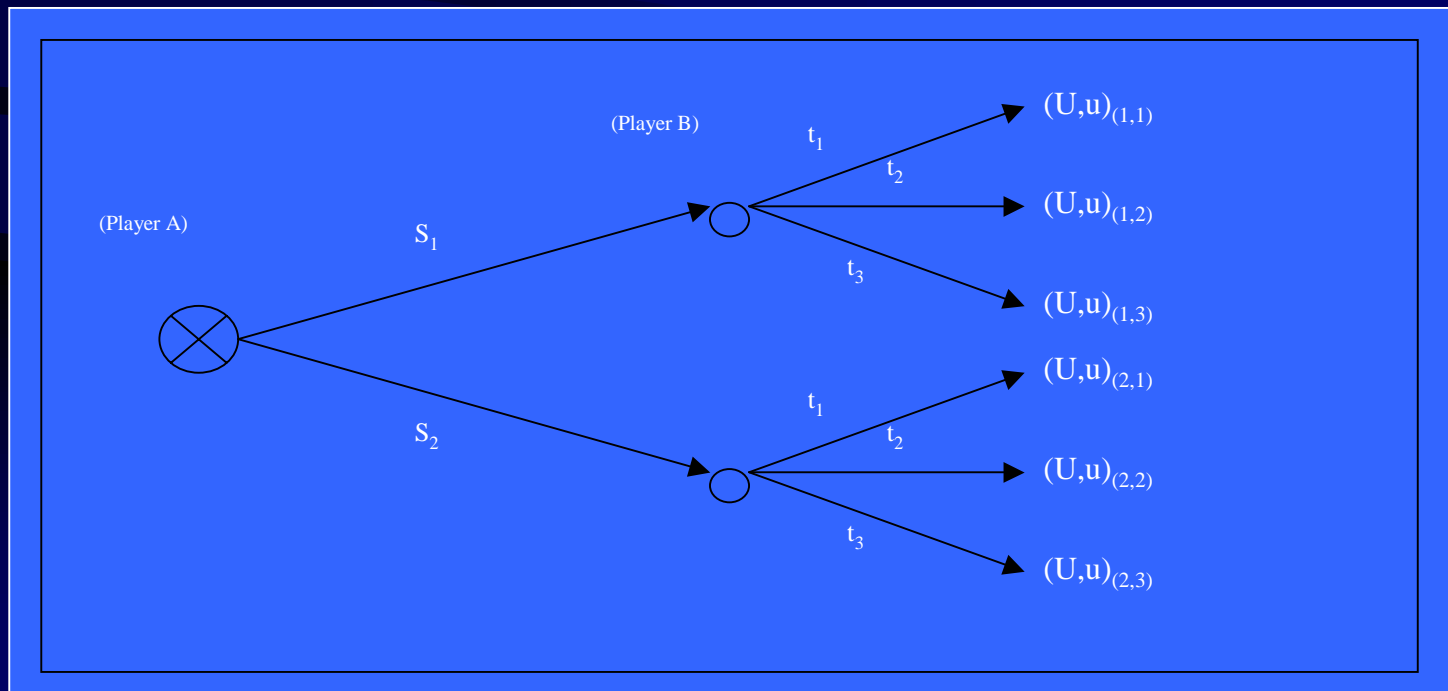
Abandoned Mines

One of the basic factors for the social mistrust due to:

- Society's argument for potential hazards of new mining projects
- evidence for the authorities' weakness to provide vital solutions for the present and future.

Model of firm-regulator interaction

- Traditional non-cooperative Stackelberg game
(*the regulator leading and the firm following*)
- Player (A): the regulator
- Player (B): the firm



Players' Alternatives Strategies

Player A

- S_1 : applies the traditional command and control policy, namely player (A) just determines the environmental standard
- S_2 : adopts the new proposed EU directive, which compels the firms to provide financial guarantees for potential environmental damage
- S_3 : includes the financial guarantees of (S_2) but also adds an extra fee to fund abandoned mine reclamation activities

Player B

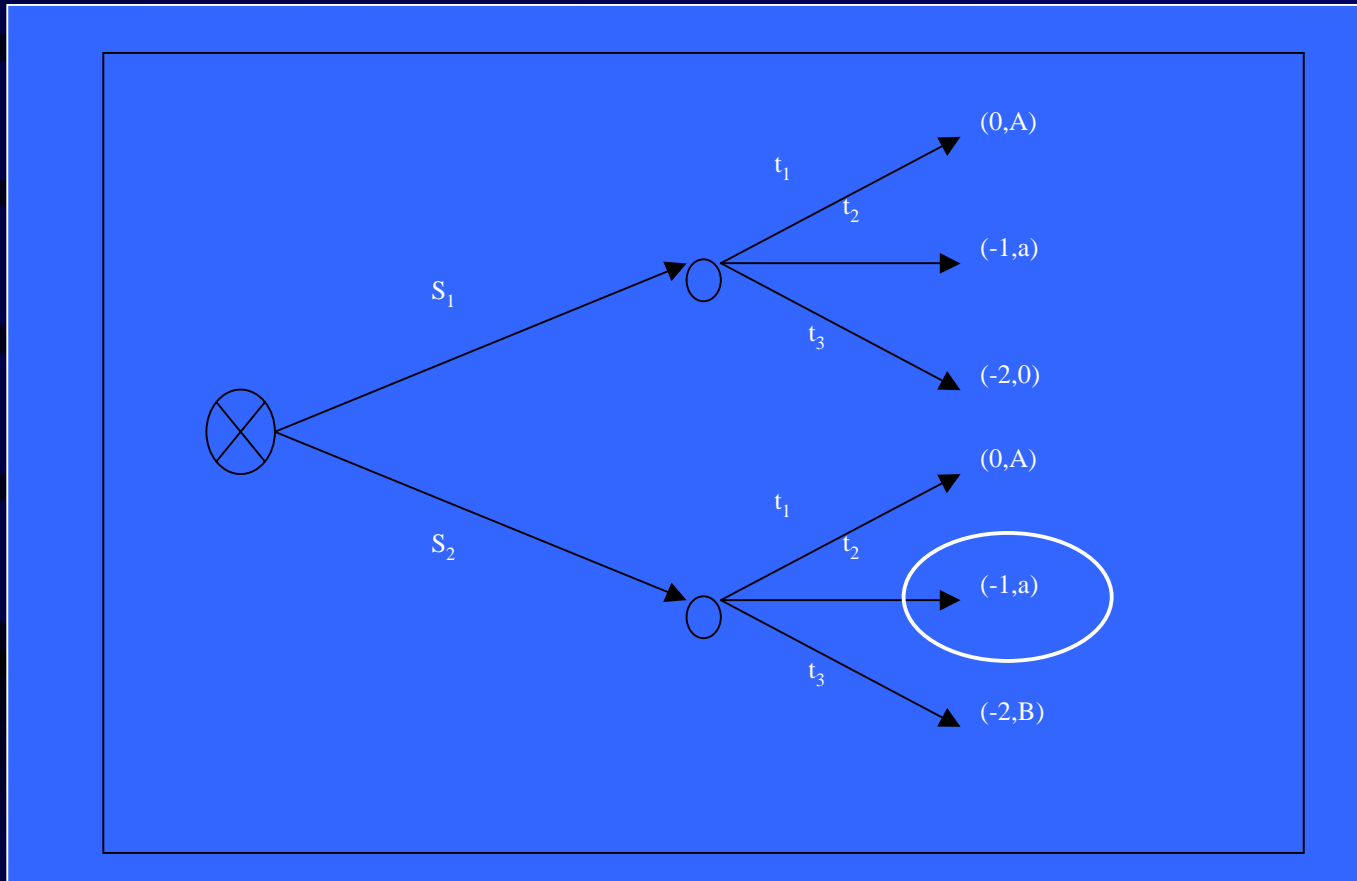
- t_1 : responds with full responsibility to the preventive and rehabilitate actions, delivering a land ready for new use (optimistic case)
- t_2 : remedies the site but not at a level substantial enough to be properly ready for new use
- t_3 : abandons the site without any restoration (gloomy case)

Players' payoff

- Let U denote the payoff of player (A): the social utility function
- Let u denote the payoff of player (B) : the cost of each strategy

Player A	Rate U	Player B	Rate u
Abandon the site	-2	Cost of full Restoration	A
Partial Restoration of the site	-1	Cost of Partial Restoration	a
Complete Restoration of the site	0	Value of financial Guarantee	B
Restoration of an Abandoned mine	1	<i>Note: $a \sim B$ (approximately equal)</i>	

Extensive form of game



one pure-strategy equilibrium (S_2, t_2)

Normal form of new game

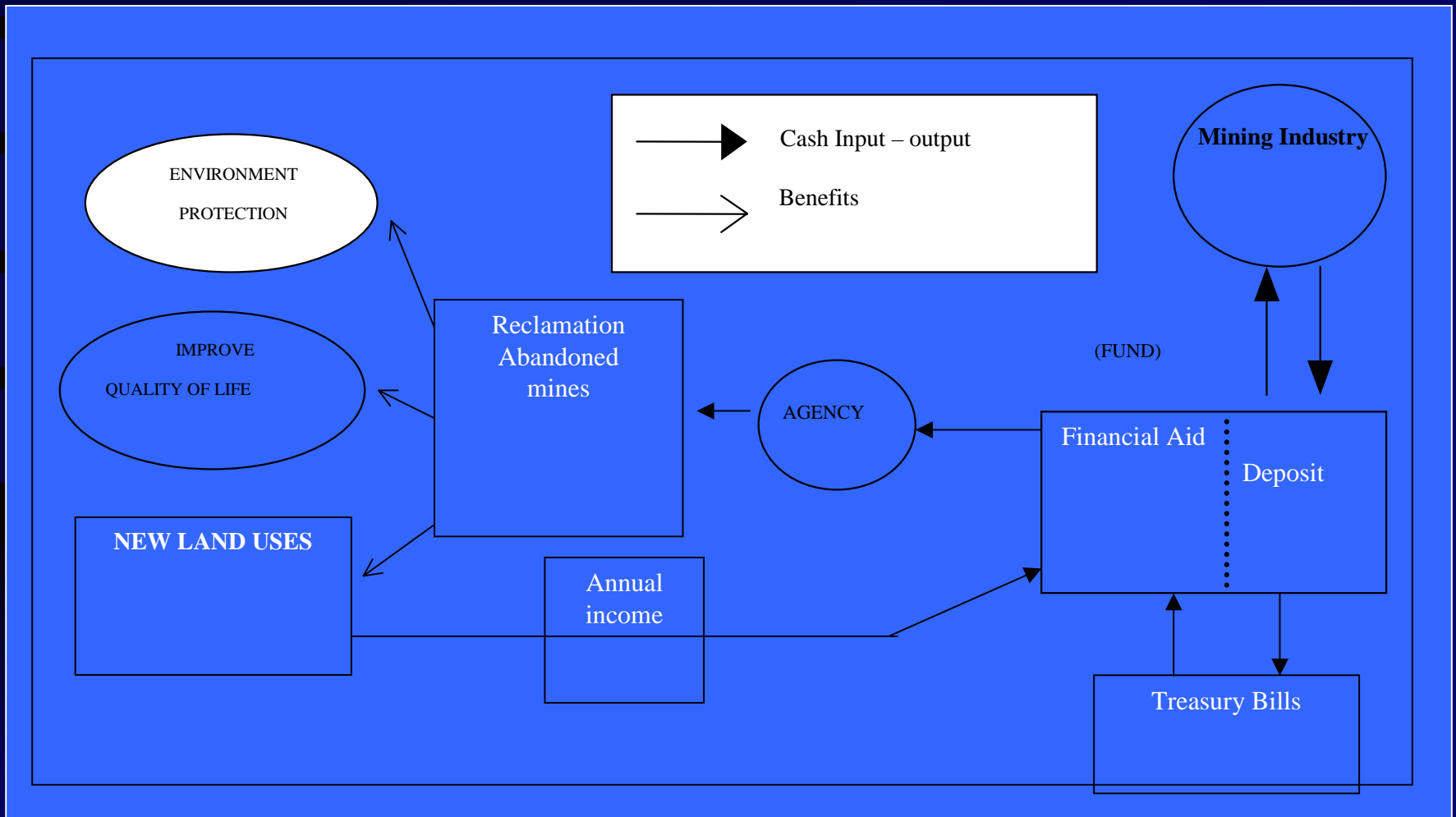
	t_1	t_2	t_3
S_2	$(0, A)$	$(-1, a)$	$(-2, B)$
S_3	$(1, A+c)$	$(0, a+c)$	$(-1, B+c)$

one pure-strategy equilibrium (S_3, t_2)

two significant outcomes

- financial guarantees are a necessary condition to improve prevention but not sufficient to satisfy the society's claim
- regulatory stability could be achieved with a mechanism, which would secure funds for both the abandoned mines and the potential damage

An alternative funding model for the abandoned mines



Note: the proposed directive offers the appropriate framework

Conditions for Cooperation

- Firms should participate in the strategic decisions of the environmental agency
- Agency should administrate the restored mines for a particular period (property rights)

Conclusions

In a competitive international environment, a legislative stability is one of the key elements required in order to strengthen and attract new investment funds for the domestic mining industry

- The rehabilitation of the abandoned sites could play a significant role
- Strategic cooperation between mining industry and the state (regulator), is a viable way to resolve gradually the issue of abandoned mines
- Authorities are responsible to form the right conditions where this cooperation can be realized