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Abstract:

This article approaches the values underpinning derelict mining rehabilitation plans, their assessment in monetary terms, and reviews the empirical studies literature on this theme. The paper correspondingly contains four main aims. The first involves putting into perspective the thematic content on the rehabilitation of derelict and depressed mining areas, transforming them into mining heritage tourism products designed to trigger sustainable regional development. The second aim, concerns defining the range of benefits and values potentially arising. The third seeks to demonstrate and discuss why and how the theoretical frameworks of Total Economic Value (TEV) and economic valuation, taken together with the contingent valuation approach, enable the monetary estimation of the range of non-market individual values, through eliciting the individual's willingness to pay (WTP) for the rehabilitation. And the fourth objective incorporates reviewing the literature on empirical studies estimating the monetary values of mining rehabilitation plans through recourse to the Contingent Valuation (CV) approach. We proceed by demonstrating that TEV, the economic valuation concept and CV are approaches appropriate to estimating the aforementioned benefits; we defend their utility as important inputs to raising the efficiency of political decision making processes and ensure local populations actively comply and participate in the rehabilitation process. Finally, we conclude that the empirical studies hitherto applied for estimating the monetary values of mining rehabilitation and remediation through recourse to CV remain very few despite the fact that this estimation type is increasingly recognised as an important tool in decision making processes on the rehabilitation of industrial cultural heritage in general, and mining heritage in particular.

JEL: R11, O29, L83, Q53, L72

Key-Words: Mining; Rehabilitation; Benefits; Cultural Heritage; Tourism; Contingent Valuation.

1. Introduction

Governments are often left with liabilities for abandoned mine rehabilitation due to the effective recovery of such contaminated sites implies: expensive undertakings; complex technological solutions; the involvement of local authorities and the input of many other differentiated stakeholders; and the acceptance and recognition of the rehabilitation plan by society. Overall, rehabilitation of these degraded, abandoned mining fields is currently

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perceived by national and local authorities, stakeholders, and the overall local communities as of great value to nurturing the sustainable development of socio-economically depressed regions (Conesa et al 2008; Ballesteros and Ramirez 2007; Hospers 2002; Jonsen-Verbeke 1999; Edwards and Llurdés 1996). Today, many former and now redundant mining areas are undergoing rehabilitation and turned into industrial heritage tourism sites for regional revitalization. Among many others, several significant examples may be cited, such as Cornish Mining World Heritage in the UK (http://www.cornish-mining.org.uk/, accessed on 7th Feb 2013); the Zollverein Coal Mine Industrial Complex in Essen (http://www.germany.travel/en/towns-cities-culture/unesco-world-heritage/essen-zollverein-coal-mine-industrial-complex.html#, accessed on 7th Feb 2013); Emscherpark, and both in Germany (http://www.dac.dk/en/dac-cities/sustainable-cities-2/all-cases/green-city/emscher-park-from-dereliction-to-scenic-landscapes/?bbredirect=true, accessed on 7th Feb 2013); Llechwedd Slate Caverns (http://www.llechwedd-slate-caverns.co.uk/., accessed on 7th Feb 2013); and Big Pit Museum (http://www.museumwales.ac.uk/en/bigpit/, accessed on 7th Feb 2013) both in the United Kingdom; Parque Minero at Rio Tinto in Spain (http://www.parqueminerioderiotinto.com/. accessed on 7th Feb 2013); or the Lousal Mine in Portugal (http://www.lousal.cienciaviva.pt/home/, accessed on 7th Feb 2013).

Prior to the 1970s, in the absence of any laws imposing land recovery and restoration requirements, mines simply closed and were abandoned and leaving the local economy and populations to go through a traumatic process of declining employment and wealth, having to deal with a downgraded level of environmental quality. Where legal requirements existed, the land reclamation usually consisted of destroying every trace of mining activity due to being deemed ugly and dirty. Hence, the major focus was placed on the restoration of the natural environment and the ecosystems that existed in the pre-mining period (the Portuguese legislation is as a good example of the early mining reconversion issues - Decree-Law no. 198-A/2001, 6th July). The fact remained however, with or without reclamation laws, the typical mining culture tended to disappear due either to the emigration of miners or to a consistent community exercise to forget the memories of exploitation, poverty and the sheer toil of generations of miners. In the 1970s, very slowly, an awareness of abandoned mining fields began being internalized by the European local authorities and populations. Hence, a new cultural aesthetic concept began to emerge; the “aesthetics of deindustrialization” concept or that of the “aesthetics of scenery decline” as Edwards and Llurdés 1996 termed it. Gradually, the degraded environment and the scenarios surrounding derelict mining fields became distinctive landscapes containing the geological and environmental remains of mine operation and other industrial activities; the buildings; as well as the technological vestiges of mine

operations alongside those of means to transport the ore; and miner "artifacts" (Edward and Llurdés 1996) and thereby rendered as culturally attractive as a cathedral, a museum, or a beautiful landscape. Actually, populations do perceive derelict mining plants and surroundings, their "artifacts", "sociofacts" and "mentifacts", as relevant industrial heritage with cultural value. In keeping with this, mining degraded landscapes, and the overall mining remains, began gaining increasing popularity as the trigger for promoting industrial heritage tourism (or industrial culture as in Hosper 2002, p. 398) with this specific cultural tourism form viewed as the tool more appropriate (and, mostly, the only one existing) for regional restructuring and the redevelopment of degraded mining regions (Conesa et al 2008; Ballesteros and Ramirez 2007; Hosper 2002; Jonsen-Verbeke 1999; Edwards and Llurdés 1996). The kick-off for the industrial heritage tourism trend as a strategy for regional restructuring and regeneration took place in the UK but gradually spilled over to other degraded European industrial zones. After the apparent great success of some experiences in the UK (Wales and Iron Bridge), Germany (the Ruhr area) and France (Nord-Pas-de-Calais), industrial heritage tourism and particularly mining heritage tourism became perceived as a very serious option for promoting the redevelopment of historical mining regions. Today, there is the International Committee for the Conservation of Industrial Heritage (TICCIH) whose "*aim is to study, protect, conserve and explain the remains of industrialization.*" (http://mining.about.com/gi/o.htm?zi=1/XJ&zTi=1&sdn=mining&cdn=b2b&tm=166&gps=345_121_1688_814&f=00&tt=2&bt=1&bts=1&zu=http%3A//www.ticcih.org/) with the framework of which mining sites represent a sub-category; a Word Heritage List (UNESCO) that includes Cultural Heritage Sites featuring outstanding mining landscapes (today, 24 of the 60 industrial sites under UNESCO protection are mining related); the European Association of Mining Industries, Metal Ores and Industrial Minerals (http://www.euromines.org/ , final access: 8th February 2013); or the European Union of Industrial Heritage (http://www.erih.net/fileadmin/Mediendatenbank/Aktuelles/ERIH_Membership_brochure_english.pdf , final access: 8th February 2013).

Nevertheless, the transformation process of derelict and degraded mining landscapes into areas of interest for tourism, culture and recreation by any means proves a major challenge for the authorities, technicians, tourism managers, stakeholders and local population. We should recall how derelict mining landscapes suffer from several disadvantages that may turn into obstacles to rehabilitation. In the first place, in order to attract tourists, these landscapes and their industrial remains are far from beautiful in the sense of a cathedral or a museum. Secondly, these areas are characterised by severe degradation of their environments and surroundings, which renders difficult attracting the new and complementary activities

necessary to implementing the industrial heritage tourism project. A third drawback is the peripheral locations of mines in relation to classic tours. Hence, the majority of abandoned mining fields are seen, at first glance, by populations as only marginally profitable, with rehabilitation very expensive and, therefore, not in a position to return significant profit levels. Hence, in order to rehabilitate a degraded mining field for industrial heritage tourism, several obstacles must first be overcome. The first concerns awareness about the local appreciation and interest in reconversion. This awareness depends firstly on the extent of the attractiveness of the mining landscape to both local populations and potential tourists, and the degree of emotional and personal links with the mine's own history, secondly with the tourism conversion potential of the mining plant and its surroundings; and thirdly its respective capacity to generate the financial resources for rehabilitation. The second obstacle stems from the sheer planning needs inherent to rehabilitation and the management of such disperse, multidimensional, industrial heritage in a fashion able to guarantee some regional development success. These planning needs, in turn, interrelate with the following issues. The first derives from the complex considerations implied in rehabilitating mining plants and their surroundings for tourism with respect to the preservation of the physical plant and the environment, the preservation and enforcement of community mining heritage, under the restrictions of the health and safety factors inherent to opening up these vast polluted sites to the public. Secondly, because a cluster of several tourism activities must be created in situ, which includes information and educational centers, tourist visitor centers, museum attractions, industrial heritage buildings as tourist accommodation or industrial heritage site leisure and sport facilities (Jonsen-Verbeke 1999; Edwards and Llurdés 1996). However, all these facilities have to be supported by a second cluster of small projects with some not necessarily dependent on mining heritage like souvenir shops, cafes, restaurants, small shops selling regional products or transport attractions like mining railways or boating. Finally, strong complementarity must be created between the mining field and other regional cultural tourism attractions to build a regional network of diversified tourist sites, which configures the third cluster. Hence, the main issue underlying the planning activity should incorporate the encouragement of synergies between the three clusters, thus triggering sustained local individual innovation and entrepreneurship by means of the creation of a business support system capable of enhancing the ambitioned sustainable regional redevelopment. Finally, the third main obstacle deals with the necessity of getting commitment from local and regional authorities, stakeholders, and the overall population, while maintaining the mining identity and community. This commitment is only achievable when actors recognize that degraded mining plants and surroundings may prove a profitable means for triggering regional social-

economic recovering and therefore worthy of large-scale investment. One tool for achieving this is the act of valuing the social mining memory (Mistzal 2003) or its identity (Ballesteros and Ramirez 2007) by using it as a complementary tool in the tangible rehabilitation of mining buildings, infrastructures and artifacts, strengthening the miner's identity as a social group and reinforcing social cohesion (Landdorf 2011).

One means of contributing to fostering the success of industrial heritage tourism plans involves estimating the likely economic, environmental and social effects generated in monetary terms. The act of translating into monetary terms the entire scope of benefits people may attain should a rehabilitation plan go ahead represents one important step in building up additional information to provide a clearer picture of both individual and social preferences as regards the rehabilitation plan. Estimating the local community's willingness to pay for mining heritage is one means of obtaining some insights into the total economic value potentially deriving from the rehabilitated mining plant and landscape. Moreover, such estimations also offer a key input to assessing the mining rehabilitation policy and social viability of plans linked to mining cultural heritage and aimed at generating value out of derelict mining landscapes. Plans involving environmental rehabilitation together with the recovery of derelict mining exploration activity related remains such as buildings and infrastructures involved in mining technologies, and the transport or transformation of ores, and the rebuilding and strengthening the remaining mining culture, may generate a fuzzy set of benefits to the local society and host region and that undulate in intensity over the course of time and space. Some of these benefits are easily assessed by markets (hence termed the marketed benefits) but others are not, due to their particular nature. The latter, the non-marketed benefits, incorporate a range of intangible benefits linked either to recreational uses, educational and cultural effects, or to aesthetic and/or symbolic contents; therefore there are correspondingly no real markets or pricing for reflecting their value. Nevertheless, their importance and weight dictates the necessity for using economic valuation approaches to measure them. In conjunction, approaches such as contingent valuation have been applied to quantify all of the values, including non-market values, people place on ecosystems and their rehabilitation, environmental rehabilitation policies, and culture heritage. Therefore, the main purpose of the present article is to assess if and how the contingent valuation technique has been deployed for estimating the economic value of mining landscape rehabilitation plans in order to attain insights into the main purposes, technical details, and results achieved by those empirical valuation exercises. The structure of the paper reflects this objective. In section 2, the main methodological interrogations accruing from the mining rehabilitation context for cultural heritage tourism are outlined. In section 3, we describe the benefits these types of

rehabilitation plans are supposed to generate. In section 4, we define the TEV concept and discuss it as the more appropriate theoretical approach for assessing the range of non-market rehabilitation values. In section 5, we define the concept of economic valuation underpinning the TEV concept and, in section 6, the CV approach is presented as the most adequate stated-preference method for eliciting the individual's WTP for the rehabilitation plan. In section 7, we defend the estimations of the non-market values as important inputs to raising the efficiency of political decision making and to encouraging populations to actively participate in the rehabilitation plan. In section 8, we present the literature review on the empirical research concerning the use of CV in the valuation of mining degraded landscapes. Finally, we reach our conclusions.

2. The mining rehabilitation context for cultural heritage tourism

Here, we consider the role of rehabilitation plans in their more strategic sense as components in regional development planning that deals with the wider issues, time spans and synergies interconnecting depressed mining communities with socio-economic development. Correspondingly, heritage industrial tourism rehabilitation plans for former mining areas seek out solutions able to reactivate the now defunct mining communities experiencing strong crises following the closure of the mining facility and requiring economic diversification capable of triggering sustainable regional development solutions. To bring about this heritage tourism rehabilitation, several aspects must be taken into consideration (Conesa et al 2008; Edwards and Llurdés 1996). Firstly, the mining plant and its surroundings and whatever the remaining links with the mining sector must display what the literature calls sufficient "aesthetics of deindustrialization" in order to make the mining area attractive enough to represent an incentive to local stakeholders and authorities considering investing in costly repair and restoration activities across large areas heavily impacted by environmental and landscape degradation and in mining heritage based projects. Edwards and Lluerdés op. cit. propose a typology for choosing those mining sites of sufficient attractiveness to function as industrial heritage attractions. They divide them into four groups of attractions. The first is the "productive attraction" group, which contains all the attractions interlinked with the respective geological formation and the sort of ore extraction techniques used. The attractions may be either on the surface or underground with terraces, open-pit or open-mountainside quarries examples of the former, while the latter may be either adit (allowing direct access from the surface to the underground through tunnels) or deep-shaft (allowing direct access by pit cages through vertical shafts). The second group is made up of "processing attractions" and may include either site-based or site-serving processing attractions. The basic idea of these

sets of attractions is to show to visitors just how the ore was extracted and, eventually, further transformed by whatever type of industrial process. The third group is formed by the "transport" attractions associated with mining heritage, whether underground or on the surface. These may include underground access to a deep-shaft mine by cage; underground tours in tramcars or trains; train site-tours on rails or by water (along restored canals or ports) or by road. Finally, the fourth group includes the "social-cultural" attractions such as the physically remaining "artifacts", "sociofacts" and "mentifacts". Artifacts represent "those elements of culture that refer to matters of livelihood and the entire technology of supplying good and services", (Edwards and Llurdés 1996, p. 353). Miners artifacts includes the buildings where the miners and their families lived, the mining villages, the model of urbanization and the entire social and collective support infrastructures ranging from the church, the local market, the green spaces, through to administrative facilities, schools, etcetera. Sociofacts include "aspects of kinship, family relationships and social organisations, …" (Edwards and Llurdés 1996, p. 353). Finally, mentifacts refer to "cerebral, psychological or attitudinal characteristics, including religion, magic, language and basic values systems" (Edwards and Llurdés 1996, p. 353). The second aspect is bound up with the need to create local and regional business initiatives to promote a sustainable and synergetic network of mining heritage based projects, and also incorporating other diversified productive activities in the region – such as other forms of heritage cultural tourism, ecotourism, rural tourism, agriculture, game, leisure, small industries based on the production and transformation of local and regional traditional products or craft. The third aspect deals with the need to environmentally restore the mining landscape in which there are commonly high levels of heavy metal concentrations. However, this differs from the objective of recovering the pre-existing natural landscape as in the past and instead with the objective of controlling the effects of pollution and lowering the human risk to exposure while maintaining the remains related to extracting ore and its subsequent industrial treatment (e.g. slag heaps, smelting ashes, or the toxic substances dispersed in water thus transforming previously clear and transparent watercourses into colourful and highly acid environments) and thus maintaining the distinctive characteristics of abandoned mining landscapes. Finally, the fourth aspect stems from the need to create strong publicity campaigns targeting not only among the local and regional community but also the general public as well.

Jonsen-Verbeke (1999) review several international experiences of rehabilitation to conclude that there are at least three types of models (or way –of-doing) for implementing industrial heritage tourism recovery processes : the Emscherpark Model in Germany (http://www.dac.dk/en/dac-cities/sustainable-cities-2/all-cases/green-city/emscher-park-

from-dereliction-to-scenic-landscapes/?bbredirect=true, accessed on 7th Feb 2013); the Eco-Museum concept (for example in Leward, France http://www2.chm-lewarde.com/english/index2.htm, accessed on 12th Feb 2013); and the British Heritage Tourism model (as in Bois-du-Luc in Belgian http://www.ecomuseeboisduluc.be/accueil.html. accessed on 12th Feb 2013). All these models are based upon the existence of potentially attractive derelict and abandoned mining heritage sites serving as the main input to creating not only a local but also a regional tourism product mix. In order to develop the economic potential of this specific type of heritage, a range of tourism activities were designed and implemented. Examples include the creation of information and educational centres, tourist centres, museum attractions in a much broader sense than usual; retailing and the restoration and conversion of mining buildings into tourist accommodations; and the building of sporting and recreational facilities (Jonsen-Verbeke 1999). To socially and economically sustain the rehabilitation mining planning process into the long term, this needs framing within the broader context of regional redevelopment. A mining heritage tourism project isolated from its regional context will prove unable on its own to generate the economic and social synergies necessary to winning the commitment of stakeholders, the local population and the authorities (Hospers 2002; Jonsen-Verbeke 1999; Edwards and Llurdés 1996). It is thus essential that mine rehabilitation represents one facet in a network of other complementary industrial sites and/or types of cultural heritage, thereby establishing a strategic and attractive interlinking pattern for consistent regional redevelopment planning. However, within this framework, the repetition of similar or comparable attractions across several locations must be avoided with diversification in the supply of tourism cultural services worthwhile supporting. Moreover, and from the visitor's point of view, it is important to have the opportunity to choose from different, although complementary, types of tourism routes, each offering a significant variety of tourism activities capable of interesting the tourist for more than just a few hours.

3. Rehabilitation plan potential benefits

Mining rehabilitation plans – or strategies - for cultural heritage tourism and recreation are susceptible to generating a range of environmental, cultural, economic and social impacts. Rehabilitation plan benefits for large areas spoiled by early mining are widely dispersed in terms of both where they accrue (e.g. locally/regionally; short/long run; the respective economic sector – agriculture, industry, tourism - benefiting) and to whom they accrue (e.g. people in general; businessmen; landowners; associations; politicians). The diagram in Fig. 1 provides a framework for better understanding this fuzzy set of benefits and the expected improvements to the wellbeing components, as defined in MEA (2005).

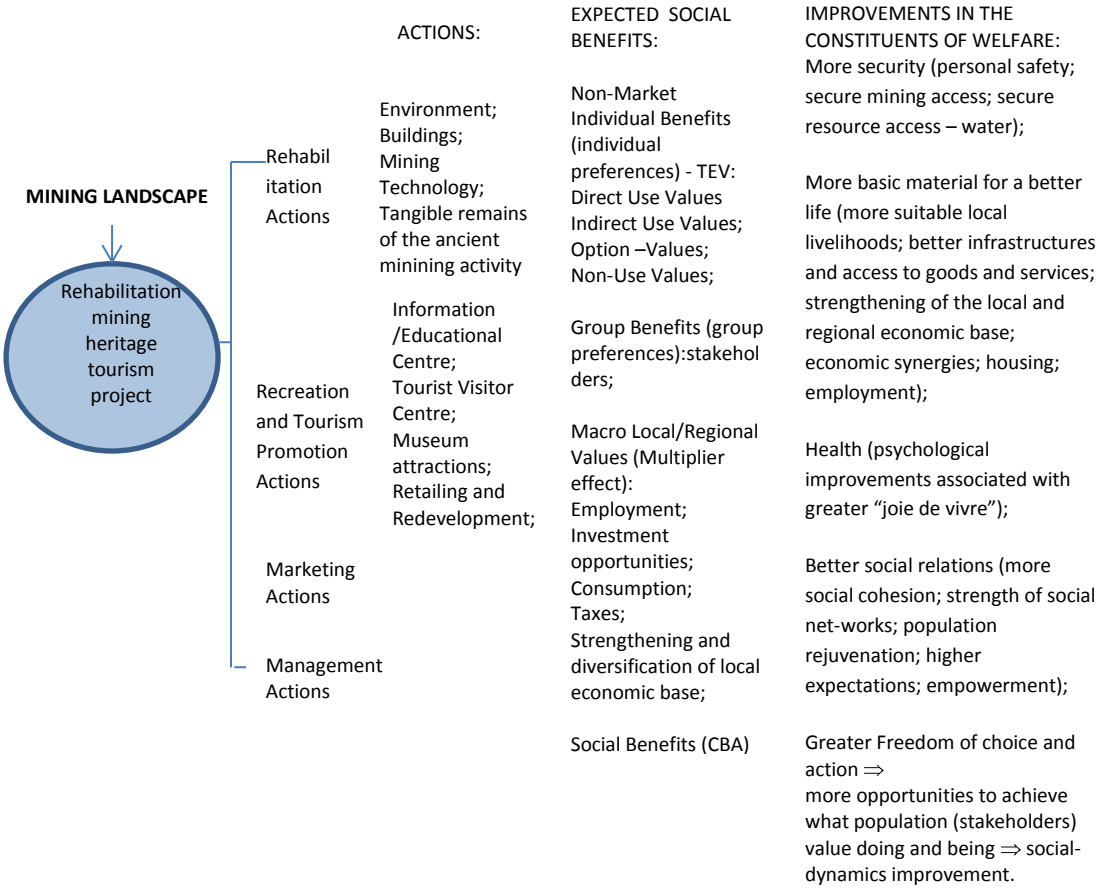

Figure 1 The Benefits Framework

The rehabilitation of the natural environment in conjunction with the physical remains of mining operations and promoting recreational and tourism activities bears direct impacts during the project's active implementation phase. Recreation and tourism help sustain these positive effects on employment and wealth creation, thus over time generating a stream of social economic effects. Moreover, increasing employment and wealth may strengthen local and regional demand, which provides a boost to revitalising and reinforcing local chains of supply. This consolidation takes place through strengthening stakeholder private investments in tourism and recreational activities and not only connected with mining heritage, but also with other kinds of complementary activities e.g. investing in the production of regional agricultural and manufactured products or in coffee shop or restaurant services. Marketing actions, furthermore, create more jobs and attract visitors in sustainable numbers. Finally, in addition to creating direct additional employment opportunities, the management actions of effective strategic rehabilitation plans also guarantee support and encouragement to the plans' synergies. Job creation, the strengthening of local and regional markets, increasing household wealth, and the profits of

entrepreneurs constitute a sound basis for increasing local government tax revenues, which releases sustainable financial resources for improving the well-being of local populations.

In short, we may defend that mine rehabilitation strategies are expected to generate a range of socio-economic benefits such as new jobs, increased wealth, stronger local and regional markets, and so on. These constitute the set of market benefits and classified in terms of: short-run and long-run benefits; benefits at local and regional scales; benefits that affect individual preferences (or micro scale benefits), group preferences, or social preferences (macro scale benefits), and directly or indirectly induced by the project's actions. Rehabilitation project market and social benefits are currently assessed through the Environmental Impact Assessment (EIA) approach, where the economic impact assessment (EcIA) and social impact assessment (SIA) approaches are implemented separately and applying a miscellaneous range of different criteria and variables quantified in different units of measurement (Gillespie and Bennett 2012; Ivanova et al 2007; Damigos 2005). EcIA currently uses Input-Output (IO) analysis, and/or Benefit-Cost Analysis (BCA) to assess the benefits and costs of mining plans at a macro level (Fig 1). IO estimates the viral effect of tangible economic consequences of a particular project by identifying changes in value added (wealth), income, employment or taxes, across local and regional economy at a macro level. BCA assesses the net benefits of the projects to society as a whole and should include not only the benefits and costs from the private point of view (such as the project's financial and infrastructural impacts) but also the benefits and costs from the social point of view (environment, cultural and social); however, this is no longer current practice. SIA involves the analysis of social aspects like peoples' ways of life (on a day-to-day level); culture (customs, values and beliefs); community (cohesion, stability, services); and environmental aspects (Fig 1). EIA is the orthodox methodology more commonly deployed to assess project impacts and reports both advantages and disadvantages. It generates very consistent, detailed social and economic results but there is little or even no evidence on the integration of social and economic impact assessments (Ivanova et al 2007). Such a lack of integration is by no means a limitation to the usefulness of the application of these methodologies for accessing the entire scope of benefits potentially induced by mining rehabilitation plans.

However, market benefits such as employment and wealth are not the only benefits one expects to result from rehabilitation strategies. Indeed, the set of other non-market benefits and costs affecting individual preferences and well-being (McFadden 2010), such as external benefits, benefits associated with usage and consumption of public goods or the intangible benefits linked with ethical, religious or bequest motives, are rarely taken into

consideration by these techniques given the difficulties in assessing them qualitatively and monetarily. In this paper, we are precisely interested in capturing these benefits in terms of the individual benefits represented by changes to individual preferences or wellbeing brought about by the cultural tourism mining rehabilitation strategy.

4. The TEV Concept

The TEV concept is currently largely deployed for estimating the range of non-market environmental and cultural benefits. In this paper, our aim is not to contribute to the discussion on the advantages or disadvantages of using TEV to monetarily estimate the non-market benefits of projects, although as an economist I personally advocate the approach while recognizing the method does have some difficulties and weaknesses due to being based on individual preference improvements. The literature presents a wide range of opinions against and in favour of utility based economic valuations although they have quite recently been gaining ground within the cultural heritage context (Báez and Herrero 2011; O'Brien 2010; Provins et al 2008; Dutta et al 2007; Holl and Howarth 2000; Navrud and Ready 2002).

The standard economic approach to assessing non-market mining rehabilitation benefits begins with defining "rehabilitation benefit" or "rehabilitation's TEV" (that both mean the same). Both arise when individuals gain greater satisfaction or happiness by consuming and/or using, directly or indirectly, new goods and services provided by the rehabilitated mining landscape (this definition based on the concepts of "benefit" and TEV associated with environmental changes, as defined by Turner et al 2003; Pearce et al 2001; or Throsby 2001). As rehabilitation plans contain several different dimensions, as discussed above, the individual thereby obtains utility or wellbeing from the different facets of that rehabilitation plan. Actions implementing rehabilitation may trigger different kinds of benefits for the locals and the visitors. First and foremost, the industrial mining heritage consisting of the remains of industrial culture, e.g. administrative buildings, warehouses and stores, workshops, factories, means of transportation and the transport infrastructures related to the industry, and the places used for social activities, e.g. churches, housing, health, and education, deemed of historical, technological, social, architectural or scientific value, must undergo rehabilitation. Some may be rehabilitated and converted for re-use by cultural and recreational activities. The kind of values that individuals place on the mining heritage conserved in situ may be defined by direct use value, option value, existence and option value. Direct use value consists of visiting the mining landscape for cultural and recreational purposes; it also includes vicarious use-value addressing the possibility that an individual

may gain satisfaction from pictures, books, artifacts or broadcasts of mining landscapes even when he/she will not be able to visit such places. Option values derive from preserving the option of using the mining facilities and surroundings in the future when they cannot be used by individuals in the present. Direct use value and option value belongs to the category of use value. Existence value (or intrinsic benefits) comprises of the moral, ethical, ecological, religious, or philosophical satisfaction felt by an individual on knowing that the mining heritage, including its collective memory, will be preserved irrespective of current or future uses. The bequest benefits reflect the individual's altruistic satisfaction from knowing that the mining heritage will be rehabilitated and preserved for the benefit of their heirs as well as the local community. Existence value and bequest value are non-use benefits (or passive use benefits) and include the intangible benefits some individual may have by simply knowing that the mining heritage exists and persists even if they never use it. The rehabilitation of natural landscapes and ecosystems to control the pollution of the surface, groundwater and dams caused by acid mine drainage, the stabilization or elimination of mine tails, or the remediation of the soils with punctual revegetations, may have indirect use-value to the locals and visitors due to health benefits and risks avoided. Bequest value is also related with the rehabilitation of derelict mining patrimony and its conversion into an element capable of generating employment, wealth, and therefore wellbeing, helps strengthen the image and self-esteem of the locals. Bequest values may also reflect on the expectations people place on the rehabilitation plan, as regards potential improvements to the local economy. The poor socio-economic context that characterizes these areas may raise individual expectations as regards a set of fuzzy future benefits therefore affecting the preferences or the utility of individuals. Other types of values, like direct use values, are not expected. This type of value is connected with the act of visiting the mining area in the present. Therefore, as rehabilitation is a long-run plan, improvements in the utility of current visitors and locals are not to be expected.

The aim of this paper focuses on the assessment of individual non-market values only according to the TEV conceptual framework, and not the monetary valuation of group or macro local/regional market benefits. The monetary value of the latter may be assessed by using multiplier analysis where the underlying ideas is that a particular economic activity such as mining heritage tourism is linked with others through an input/output relationship (see for instance Ivanova et al (2007) or Courtney et al (2006) for a description of the role of natural heritage in the local economy).

5. The Concept of Economic Value to Mining Rehabilitation Plans

TEV is defined according to the concept of economic valuation. Originally, economic valuation was applied to specific environmental one-action projects; however, policy makers recently recognized it as a useful tool for monetizing more complex and structural societal plans including several actions, with different geographies, scopes, timings, and stakeholder values (Vandermeulen 2011) and, therefore generating a range of varying benefits. Economic valuation is a means of obtaining a single money measurement for a wide range of individual benefits (Fig 1) through enabling the evaluation of rehabilitation plan improvements in well-being so that these can be integrated into a cost-benefit analysis or an IO assessment. This valuation process expresses the disparate components of well-being in a single unit (not necessarily, but typically a monetary unit), making them intelligible and comparable to the costs of rehabilitation. In that changes in utility cannot be directly assessed, utilitarian economic valuation provides a means for doing this indirectly. The utilitarian based approach to evaluation ensures the value of a rehabilitated mining area stems from a number of ways and depending on how individuals engage with it. The approach is based on the fact that people may benefit (in the sense of gaining satisfaction or utility) from usage of rehabilitated mining areas either directly or indirectly, in the short run or in the long run. Following the Hicks (1939) and Kaldor (1939) generic economic definitions of value to define the concept of "mining rehabilitation value economic value", one may define the economic value of a mining area rehabilitation plan for industrial heritage tourism as the amount of money an individual would pay (be paid) to be as well off with the plan or without it. Thus, economic value is an answer, mostly expressed in monetary terms (but not necessarily), to a carefully defined question in which two alternative choices are compared. The answer (which is the economic value) depends on the factors incorporated into the context of the choice, which are basically twofold: the object and the circumstances of choice (Kopp et al 1997). Accordingly to Mäller's (1971) and the basic model of individual utility, one can define the welfare money measures related with mine rehabilitation for tourism heritage as being the changes either in the individual preference function or in a constraint. Let $U\ \boldsymbol{x}, \boldsymbol{q}$ be a well-behaved utility function of some individual affected by the rehabilitation mining plan, where *U* denotes the level of utility (satisfaction, well-being) of the individual, ***X*** is a vector of marketed goods and services, and ***q*** is a vector of non-marketed environmental, economic, social and cultural benefits. The individual wants to choose the optimal quantity $\boldsymbol{X}^*$ that minimises the expenditure necessary to reach the level of utility U, predetermined by the individual. The minimum expenditures incurred by the individual to buy X* , whose consumption will generate a level of satisfaction sufficient enough to achieve the previous level of utility U set by by him/her, are represented by the function $e\ p, q, U$, where ***p*** is a vector of the market prices of goods ***X***. The individual

welfare money measures associated with an improvement in ***q*** due to the rehabilitation plan are returned by the following equations:

$$WTP^C = e\ p^0, q^1, U^0\ - e\ p^0, q^0, U^0 \qquad (1)$$

And

$$WTA^E = e\ p^0, q^1, U^1\ - e\ p^0, q^0, U^1 \qquad (2)$$

where the exponent *0* refers to the initial level of utility at the current derelict state of the mining area, and the exponent *1* refers to the final expected level of utility after the change in ***q*** (after the rehabilitation plan). The first measure, WTP^C , is the maximum amount of money the individual is willing to pay to secure the improvement, i.e. the Willingness to Pay Compensated money measure. This is the amount of money the individual has to pay to secure the right of having access to the additional mining benefits. The second measure is the minimum amount of money the individual is willing to receive to make him give up on the improvement, *i.e.* the Willingness to Accept Equivalent (WTA^E) money measure. This is the amount of money the individual wants to receive to make him/her as satisfied as he/she could be following the improvement. As usage of the rehabilitated mining area is expected to provide flows of benefits over a time path, the TEV associated to the rehabilitation plan will be equal to the discounted sum of WTP(WTA) flows over the individuals affected for those benefit flows instead. By applying the inter-temporal utilitarian approach, we may so estimate the TEV for a flow of environmental, social and economic benefits generated by the rehabilitated mining plant and surroundings, over a relevant period of time *T* by simply summing up the present value of the single-period individual welfare measures as in equation *(3)*:

$$TEV = \sum_{t=0}^{T} \frac{TEV^t}{1+\rho\ ^t} \qquad (3)$$

Where: ρ is a subjective rate of time preference assumed to be positive; TEV^t is the estimate of the aggregated *TEV* for the relevant affected population (*N)* by the changes at the moment *t* and is obtained so that $TEV^t = WTP^t(WTA^t) \times N$, being $WTP^t(WTA^t)$ the mean (or median) of the individual's WTP (WTA).

6. Applying the CV and TEV approaches to estimating the social benefits of mining rehabilitation plans for mining heritage tourism

Stated-preference techniques are the most popular valuation techniques used for estimating TEV (Carson et al 2005). Contingent Valuation (CV) and Choice Modelling (CM) (or Conjoint Analysis) belong to this family of valuation techniques. Both these approaches apply surveys to elicit a WTP(WTA) from individuals for hypothetical changes in some environmental or cultural good or service. In the particular case of CV, individuals are asked to rate a contingent scenario describing a hypothetical environmental or cultural change. In the case of CM, individuals are

asked to rank or to choose among hypothetical alternatives described in terms of various levels of distinct attributes. This paper only considers the CV method though referring to CM with brevity.

CV simply asks for the individual's WTP/WTA for the alterations in welfare associated with any change in the quantity or quality of mining landscape benefits through questionnaires, where a contingent hypothetical market for the change is recreated. A classical CV application is applied in nine steps (Alberini 2006; Freeman 2003; Mitchell and Carson 1989). Firstly, a clear characterization of what we want to evaluate must be made and presented to the interviewee supported by graphic means. Secondly, the definition of the relevant population whose welfare is going to potentially change must be made. The third step deals with the simulation of the hypothetical market's basic features including: *i)* what is the change that is going to be evaluated and what is the alternative to the proposed change; *ii)* when is it going to be provisioned; *iii)* and which of the welfare monetary measures WTP or WTA is going to be adoped. In the fourth step, the type of interview must be chosen: personal interview, telephone interview or mail interview. The fifth step deals with the sample definition and in the sixth, the questionnaire is set out. In the seventh step, interviews are held before, in the eighth step, individual answers are exploited in order to build up a consistent database. Finally, as the last step, the median or media WTA/WTP are estimated and their sensitivity to the socio-economic and demographic determinants analyzed. WTP (WTA) can be elicited by applying different formats (Alberini 2006; Freeman 2003; Mitchell and Carson 1989). The open-ended format directly queries the respondent into giving the interviewer a point estimate of his/her WTP (WTA) for a constant utility. A valuation function like that represented in equation *(4)* is afterwards directly estimated, via a regression of the WTP (WTA) responses on a vector of *X* variables, describing the socio-economic characteristics (e.g. income, age, education) of individuals and their attitudes towards mining rehabilitation processes:

$$WTP = \beta X + \varepsilon \quad (4)$$

where β is a vector of regression coefficients, and ε is the error term. Statistical tests of $\beta's$ provide for verifying their theoretical validity, their robustness and significance. The regression allows for the estimation of a mean (or median) WTP (WTA) for the relevant population by estimating of the sample's mean. Bidding game and payment cards are two other possible formats. In the first, each individual is iteratively asked whether they would be willing to pay (to accept) a certain amount. If the answer is YES (NO), the amount rises (decreases) and the individual is asked again whether or not he/she accepts being paid (compensated) that amount. The bidding stops when the iterations converge to a point estimate of the WTP (WTA). In the former format, payment cards, individuals are asked to choose a WTP (WTA)

point estimate from a list of predetermined monetary values shown to individuals on a card. The other format, the dichotomous choice or discrete choice, is like a referendum. Individuals must answer whether they accept being paid (to be compensated) a certain amount. The probability of getting a YES for a given amount *Y* is econometrically modelled as $\Pr\ YES = \Pr[WTP(WTA) + \varepsilon > Y]$. The response is then regressed on a vector X of variables using logit, probit or Weilbull functions (Haab and McConnell 2003). Bearing in mind increasing the efficiency of the estimates through discrete CV models to extract more information on the distribution of willingness to pay (or to accept) alternative variations were proposed like double-bound discrete models. The essence of these models is as follows. Respondents are presented with initial bid prices. If their initial response is NO, they are given new lower prices; if the answer is YES they are given new higher prices.

The CV approach was first described by Bowen (1943) and Ciriacy-Wantrup (1947) (1952) although the first empirical work was only done by Davis (1963) one decade later. Bohm's work (1972) played a key role in demonstrating the reliability of CV money measures; he proved that the potential strategic behavior problem arising from the aggregation over individual benefits might not be as important as Samuelson (1954) had earlier pointed out. Further theoretical and empirical works (e.g. Randall 1974) developed the field over the 1970s, strongly contributing towards the improvement and acceptability of the method among academics and politicians. In 1980, the method was unreservedly recognized by the US federal government as an important tool for supporting judicial decisions, by recognizing its usage (among other valuation techniques like the travel cost approach, or the hedonic approach, for example) for valuing the welfare changes arising from environmental disasters in the text of the *Clean Water Act* (1972) and of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) (1980). The second half of 1980s was crucial in terms of proving the credibility of CVM and its popularization in the USA and other European countries. Two important works are especially credited for such popularity, Cummings et al. (1986) and Mitchell and Carson (1989), with the latter contributing towards the generalization of CV beyond environmental and welfare economics. During the 1990s, a series of relevant environmental disasters renewed discussion over the real reliability of the valuation method. With the intention of once and for all proving the reliability of the method for monetizing environmental impacts beyond any doubt, the National Oceanic and Atmospheric Administration (NOAA) asked a specifically formed committee of experts chaired by the Nobel prize winners Kenneth Arrow and Robert Solo to provide their evaluation. One of the main outputs of the committee was the well Known NOAA Report (Arrow et al 1993) where CV's credibility, validity, and reliability were clearly recognized, and a number of guidelines

proposed to improve the quality of subsequent empirical applications. Currently, the method has vast applications far beyond the scope of environmental valuation, and which more recently includes the valuation of cultural heritage (Navrud and Ready 2002; Noonan 2002, 2003; Pearce et al 2002). It is largely recognized as the best approach enabling the elicitation of non-marketed values for fuzzy, not well known and likely to vary in terms of individual (stakeholder) benefits (Provins et al 2008; Borghi et al. 2007). Furthermore, CV provides one single monetary measure for different non-use values which is a rather important input to improving the IO and CBA efficiency levels as impact assessment approaches. Such distinctive characteristics ensure CV is the valuation approach one can apply to ascertain the individual WTP (WTA) for non-market values given in equation *(3)*. The other stated-preference based approach, CM, is drawing considerable interest as a technique for valuing benefits associated with the multiple cultural, social and environmental attributes of cultural plans in general and of mining plans in particular (Gillespie and Bennett 2012; Tuan and Navrud 2007; Heberling et al 2000). However, this approach has not yet been subject to the theoretical and empirical scrutiny that CV has. Furthermore, the CM questionnaires individuals have to answer are much more complex than their CV counterparts, as the respondents have to ponder tradeoffs over multiple choice sets of environmental, economic, cultural and social attributes.

The use of CV to quantify the TEV of non-market services has been one of the most fiercely debated issues within the environmental economic valuation literature over the last twenty years. One of the most debated issues has been the validity and reliability of CV welfare measure estimates, in terms of how closely they actually represent an accurate measurement of the real individual's value. The closer the real values are to those estimated, the more accurate the valuation method is. Were WTP (WTA) observable, there would be no problem. However, given they are not, it is then necessary to use other complex criteria and "rules of evidence" to assess accuracy. In measurement, accuracy means the *reliability* and *validity* of data analysis used for the valuation framework (see Alberini, et al 2006, Freeman 2003 or Mitchell et al 1989 for a comprehensive description of these methodological CV problems and also their potential effect upon estimates). A number of guidelines have been developed to represent CV credibility, validity, and reliability (Portney 1994; Arrow et al 1993). The most important are related to the presentation of adequate information over the object of choice (i.e. the mining landscape change), the context of choice, the choice of a credible (hypothetical) payment mechanism and the use of a referendum format without or with follow up open question, to elicit the WTP question. In presenting the object of choice to the interviewee, the level and type of the expected provision of the environmental attributes "with or without intervention", and if there are undamaged substitute commodities, must be

presented very clearly. The researcher must previously determine which and how environmental services affect the individual's non-market value. This can be done by using techniques such as focus groups or by simply talking with the stakeholders. On defining the context of choice, it is important to explain what is the extent of the hypothetical market by informing respondents of how and when the environmental change will occur, and about the decision rules in the usage of such provision e.g. whether by majority vote or by individual payment.

The choice of a credible (but hypothetical) payment mechanism is also very important. Taxes, property taxes, sales taxes, entrance fees, changes in the market prices of goods and services or donations to special funds are the more commonly used. Finally, the referendum format is the only elicitation format which is, under certain circumstances, incentive compatible. CV detractors argue that respondents systematically provide answers inconsistent with basic assumptions of utilitarian rational choice although non-corresponding to their real WTP. CV defenders acknowledge that early applications suffered from many of the problems critics have noted (Mitchell et al 1989); however, recognition is required of how more recent and more comprehensive studies have dealt and continue to deal with those objections (Carson et al 2005). Surely, CV welfare estimates are affected by several types of biases with most arising from the way the CV application is applied. There are several types of biases to be considered: the choice of the true value for the environmental change: WTP versus WTA; biases related with elicitation formats; information biases; anchoring biases; vehicle bias; hypothetical biases (see Alberini, et al 2006, Freeman 2003 or Mitchell et al 1989 for a comprehensive description of the biases and its effects, and a range of technical solutions to correct their effects). Detractors (Lo and Spash 2012) argue that the existence of *embedding effects* provide answers that are not consistent theoretically. The *embedding effect* refers to several interrelated regularities in contingent valuation surveys such as insensitivity to scale and scope, sequential and sub-additive effects. These types of effects happen, firstly because welfare measures like WTP are sometimes much less dependent on the quantity of the environmental service provided than it theoretically should be (*insensitivity to scale and scope*). And secondly because, when more than one environmental service is being evaluated in the same survey, the WTP for a particular one often depends on its position in the sequence of public goods (*sequential effect*). Finally, the sum of WTP for individual changes often exceeds the WTP for a composite change in a group of public goods (*sub-additive effect*). Some CV critics see the *embedding effect* as evidence for non-existent individual preferences for the public good but an individual *warm glow* effect instead, created by the survey process itself. In spite of all the difficulties arising from the implementation of a valuation technique as complex as CV, the

NOOA Panel recognized that the method is grounded firmly in economic theory and that CVM welfare estimates are valid and reliable. They recommend CV researchers to follow a set of guiding principles (Arrow et al 1993) defined by the Panel, to guarantee the best valuation practices, theoretically consistent and empirically reliable. Common practice in empirical studies applying the CV approach reveals that practitioners, although developing maximum efforts to comply with the Panel's recommendations, recognize nevertheless that the application or non-application of the entire range of recommendations depends largely on the context of which ones are subject to evaluation. This must not be interpreted, however, as a stated recognition of CV failure but as a warning to further empirical studies instead; if the context of valuation does not ensure full compliance with the NOAA Panel recommendations, all efforts must be developed to guarantee consistent money estimations. Keeping this in mind, estimations will remain reliable, although with sensible precautions.

Despite the importance of the work developed by the NOOA Panel leading to the acceptance of the CV approach, and recognition of the validity and consistency of the values produced, criticism and distrust persist however, perhaps even more reinforced as regards applications of the stated preference approach to cultural valuation (Lo and Spash 2012). Some economists like Schlapfer (2008) claim individuals give irrational answers. He states they have not got enough time to do so during the interview: the time is too short (15m-20m) for individuals to reflect or to engage in arbitrage. Further, he says, individuals do not have sufficient cognitive capacities enabling them to realize the welfare trade-off being requested under certain circumstances. Some non-economists (i.e. psychologists, sociologists, and anthropologists) also claim that the biggest problem with CV is that the approach does not allow individuals to express all the values by restricting them only to the role of rational consumers. They disapprove of the fact that the approach overlooks concerns related with procedural justice, non-utilitarianism ethics and the role of social norms, while reducing the concept of valuation to monetary commensurability. Proponents of CV respond to these criticisms, demonstrating that estimates are nevertheless sufficiently consistent and counter-argue that the solutions proposed by critics not only fail to solve the problems as also cause more inconsistencies (Lo and Spash 2012; Provins et al. 2008).

7. Why is economic valuation important?

There is a set of substantial reasons justifying the need to estimate the non-market values of the benefits enhanced by plans for rehabilitating cultural heritage in general and mining areas in particular for the purposes of cultural tourism within the framework of promoting sustainable regional and local development (see, for instance, Báez and Herrero 2012; Vandermeulen et al 2011; Provins, 2008; Ivanona et al 2007; Navrud and Ready 2002). These

reasons stem from answers to the following questions: should society spend scarce resources on high cost rehabilitation projects, when the amount and variety of social benefits and the return on private investments are unpredictable and with some benefits difficult to effectively assess?; who will finance the whole process?; the extent to which this type of plans gains popular support and to the point when they feel the need to actively participate? The first question relates to the cost-effectiveness of the projects included within the scope of the plans. Initial rehabilitation investment and subsequent maintenance costs incurred with the built cultural and recreational infrastructures must be comparable with the flows of entire benefits (private and social) that the projects may potentially generate over a given period of time, and not only with private (marketed) benefits. Projects prove socially acceptable when cost-effective, i.e. when generating a positive social net benefit. This type of information is also of clear importance to policy makers as it provides them with an efficient tool for rational, efficient decision making that internalizes and measures the entire benefits by using the same metric – money – within an environment characterized by shortages in the financial resources available for meeting the various needs of society. The second issue is related to the financing issue and the who – is – going – to - pay- for – it issue. Such plans are quite financially demanding, frequently involving not always coinciding public and private interests. Moreover, the existence of different property right regimes concerning the land occupied by the mine complex, the water lines, and infrastructures related to mining activities including mining exploration, ore industrial treatment, and the urban area, is frequently an inherently conditioning factor. Furthermore, another hurdle relates with the existence of different degrees of stakeholder expectation towards rehabilitation: some may be vitally interested in its achievement to the point of being financially committed, while others far less so. In short, one may say the financing architecture of these rehabilitation plans and subsequent management is a complex exercise involving various public and private sources of funding for the sake of their financial sustainability. Whereas the Portuguese reality, the most common sources of funding may include community investment (e.g. European Regional Development Fund – ERDF 2007-2013), national and regional funds; voluntary contributions; sponsorships; co-financing on the part of the owners of the land, buildings or other infrastructures; rates; or revenues generated by recreational and cultural activities. The economic valuation of benefits as perceived by the local population therefore becomes an important issue to the evaluation of revenues that could be obtained through voluntary individual contributions from local populations or any rates that may be applied. On the other hand, this kind of information may be an important input for assessing the demand for mining culture heritage and whether such proves sufficient enough to support any self-financing basis of the tourism plan through the

development of the mining site for heritage tourism. Finally, the monetary expression of individual benefits perceived by the local community is important information to decision-makers concerning the putative acceptance of the plan by the community and the level of commitment and involvement with the touristic part of the plan.

8. The literature survey

Unlike the thousands of CV empirical studies that have been applied to quantify the non-market values associated with natural capital since the 1970s, the usage of economic valuation techniques for cultural capital is a relatively late practice. The first cultural CV study was conducted in the 1980s but with the vast majority only published since the 1990s (Noonan 2002). CV is the most commonly applied valuation approach, although recently CM has been also applied but not as often as the fromer approach (Tuan and Navrud 2007). 45% of empirical research has been published since 2000 (Noonan 2003). Valuation studies concerning mines are very few and the majority apply stated-preference techniques to elicit the individual's WTP(WTA), with CV the favourite stated-preference approach. Table 1 summarizes the valuation studies concerning mines, tracked for this paper. To date, our literature review has identified twenty six studies concerning mining activities. More than 50% of the studies concerning mining non-market benefits and costs were published in the last decade. Sixteen applied the CV stated-preference alone or in conjunction with other valuation methods like hedonic price or travel cost; five applied the CM stated-preference approach; and seven applied or described other valuation approaches. Only four of the twenty six studies deal with the rehabilitation of derelict mining landscapes for future usages of which two applied the CM approach (Willis 2006; Collins et al 2005) and the former two used the CV approach (Lienhoop and Messner 2009; Ahlheim et al 2004). Given the stated aim of this paper is to analyze the application of the CV stated-approach to assess the non-market values of derelict mine rehabilitation plans, we now describe in greater detail only the latter two studies.

Lienhoop and Messner 2009 applied a CV approach to value the economic benefits of a post-mining lake-district in the Lusatia Region, in eastern Germany, which had been the center for energy production in the former socialist German Democratic Republic. Lusatia is Germany's driest region and has recently faced serious water scarcity problems. The water supplying the region comes from the Elbe River and since the 20th century there has been a serious conflict of interest over usage of this natural resource. Until 1990, most of the water was consumed by the large-scale open pit mining industry, which was the dominant economic activity in the region. Lignite mining activities had a deeply negative impact on the regional water balance as six tons of water was pumped from the groundwater table for each ton of lignite extracted,

which led to a serious drop in the groundwater table. After 1990, and following German re-unification, the lignite mine closed. Consequently, the water pumping ceased thus terminating the discharges into the local rivers while also triggering a socio-economic crisis in the region with high unemployment, a weakened economic structure and growing emigration. Recently, the state-owned Lusatian and Central-German Mining Administration Company has been encharged with the rehabilitation of the derelict mining landscape in accordance with the German legal framework (German Federal Mining Act), which involves the filling-in of the mine pits. The mining pits can be filled either by groundwater or by surface water. To simultaneously protect the groundwater and to improve the local economy, the rehabilitation plan aims to fill 18 pits with surface water thus creating 18 lakes. Nine of these lakes will be connected by a network of canals offering a portfolio of recreation activities. In the end, a lake-district is expected to be created and thereby generating recreational benefits for local and visitor recreational users. A range of social, economic and environmental benefits are expected from the plan including use and non-use values, and fuzzy future benefits (Lienhoop and Messner *op. cit*, p. 969), with the latter deriving from the high locally prevailing expectations regarding the new recreational infrastructure and its capacity to provide an economic substitute for the former mining activity in terms of the creation of development synergies, employment and wealth. To assess the monetary value of use, non-use and fuzzy future benefits of the lake-district plan in terms of people's willingness-to-pay, a CV approach was applied. Because of uncertainty regarding the filling of the lakes caused by potential climate problems, two possible scenarios were considered for valuation purposes, given that two of the lakes had already being filled at the time of the interview: "nine additional clean lakes and a full recreational infrastructure will be created by 2018" (scenario 1); "the current water scarcity situation will cause low water quality in three out of the nine lakes and therefore there will be less potential for recreational activities" (scenario 2). To properly design the questionnaire, focus group sessions and a pilot survey were implemented. Focus group sessions helped to define "donations into a fund", - that would help finance the development of the lake-district and its recreational infrastructure -, as the most appropriate vehicle of payment. In order to address the maximum stated individual WTP, the open-ended format was applied. This elicitation approach was considered as the most straightforward format to assess the influence of fuzzy future benefits on WTP responses. To avoid any incidence of free-riding and to identify invalid responses, this was applied in conjunction with a set of precautions. During six months, users and non-users were interrogated in order to assess the whole range of non-market benefits. 1,500 questionnaires were distributed by four trained students, on a face-to-face basis and with the purpose of the survey fully explained. Respondents were then

asked to fill in the questionnaire and send it back in a pre-paid envelope within five days. The mean WTP per household per year was €18.96 in scenario 1 and €15.94 in scenario 2. The study further concludes that CV estimates are strongly influenced by the hope of an improved regional economy as a result of the plan, which is the “fuzzy future benefits”. To investigate the statistical relationship between the stated individual WTP with the individual’s characteristics, a multiple OLS regression was used. WTP was regressed on a vector of socio-economic variables (e.g. age and income), recreational activities (e.g. number of outdoor activities, fishing), and individual attitudes regarding environmental policies and expected future use. The overall non-market benefits of the lake-district were calculated by multiplying mean WTP with the total population of households that the study defined as being those able to benefit from the plan.

Ahlheim et al 2004 applied a CV approach to monetise the additional social utility created by a future reclamation plan in a still active lignite mine north of the city of Cottbus in Brandenburg, Germany, through measuring the individual’s WTP for the plan and to find out its social-economic and demographic determinants. This region of the former German Democratic Republic had the extraction of lignite as its main economic activity. The ore was extracted by open-pit method. With the closure of most of the mines, a huge area of 86,000 hectares of devastated landscape was left abandoned. Before reunification, there had been no attempt at any rehabilitation, because it was apparently considered cheaper to leave everything as it was. However, after reunification and by drawing on European Community funding, this vast region that includes Lusatia and Saxony, began to be rehabilitated for future economic purposes such as agriculture, forestry and recreational activities, with the latter being the preferred. The study was carried out under the supervision of cooperation the Collaborative Research Center 565 "Development and Evaluation of Disturbed Landscapes" and was funded by the German Research Foundation (Deutshe Forschungsgemeinschaft – DFG). The reclamation plan consists of stopping pumping the groundwater away – thus transforming the actual pit into a lake – and therefore providing solutions for the development of future recreational activities. The future lake side is designed to embrace beaches, artificially created dunes, camping grounds, sports fields and a small marina, alongside new forests with hiking trails. Swimming, fishing, boating, biking, windsurfing and hiking are the recreational activities offered. To obtain the individual’s stated WTP for the plan, a discrete, double bounded referendum CV format with an open-ended follow-up question was adopted. The respondent was asked if he or she agreed with the reclamation plan bearing forever a certain increase in their cost of living (an overall increase in costs of living was the vehicle of payment chosen) or to do without it. The main survey was conducted by a professional polling institute and 1,014 interviews were completed. The

response rate was very high because a previous press announcement had been made and a letter of recommendation from the Brandenburg Technical University in Cottbus included. The authors detected the existence of anchoring effect (Alberini, et al 2006 or Mitchell et al. 1989) bias in spite of all the efforts to avoid this. This type of bias is caused by the double bounded referendum format and has been reported in several studies. It specifically concerns the answers subsequent to accepting the first bid. When the respondent says NO to the second higher bid, this may be due to the fact that the first bid might be considered as an anchor value by the respondent and therefore all the subsequent higher bids are rejected. Hence, the WTP might be undervalued in the presence of anchoring bias. Taking this into consideration, the authors criticize and refuse to adopt the more commonly adopted measures for countering the effects of this type of bias, such as the ad hoc reclassification of YES/NO responses as YES/YES responses. They propose, instead, to substitute the double-bounded referendum format by another elicitation format, namely the payment card method. 49% of respondents stated a null WTP, which was considered a high rate. Of these, the authors considered as being clear protest responses those stated by respondents attributed a high level of importance to the plan while showing a high aversion against the payment vehicle. The average WTP/ household/month for the Cottus Lake estimated from a logit model were €4.78 for the close-ended WTP and €5.88 for the open-ended WTP.

8. Conclusion

Today, many former mining areas that have lost their industrial function are being rehabilitated and reinvented as industrial heritage tourism within the framework of regional revitalization. However, the transformation process of derelict, degraded mining landscapes, into areas of interest for tourism is, by any means, a major challenge for authorities, technicians, tourism managers, stakeholders, and the local population. Plans like these, involving environmental rehabilitation together with the rehabilitation of derelict remains related with earlier mining exploration activities like buildings, mining technology, ore transport, or ore transformation, and the recovering and strengthening of the remaining mining culture, may generate several direct and indirect benefits to the local society and region. One means of contributing to the success of industrial heritage tourism plans is by estimating the economic, environmental, cultural and social effects that such structural plans generate in monetary terms. The TEV concept and stated-preference based economic valuation like CV or CM are recognized as the more appropriate to assessing in monetary terms the non-market welfare changes of mine rehabilitation plans for industrial heritage tourism. CV has been widely used in the assessment of environmental non-market use values and non-use values, nevertheless, its application in the evaluation of cultural capital is a relatively late

practice. Valuation studies concerning mines are even fewer. To date, our literature review identified twenty six studies concerning the mining sector. Only four of the twenty six studies deal with rehabilitation of derelict mining landscapes for future usages of which two applied the CM approach (Willis 2006; Collins et al 2005) with these two adopting the CV approach (Lienhoop and Messner 2009; Ahlheim et al 2004). The results obtained within the framework of some of these studies were deployed to make the decision-making process undertaken by the authorities more efficient and socially accepted within a CBA approach.

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Table 1 Literature Survey

YEAR	AUTHOR	VALUATION METHOD	PROJECT	MINING ACTIVITY	WTP
1985 1987	Rowe and al	CV; HP; TC	WTP to clean up and protect the Eagle River, Colorado, affected by the activity of the Eagle River Mine	zinc	Mean WTP/household/year during 10 years: $ 73,12 for the state-wide survey; $11,62 for the residents(*)
1990	Whitehead	CV	Preservation value of bottomland hardwood forest threatened by pressure from surface coal mines	coal	One-shot donation WTP/household between $6-$13
1991	Whitehead and Bloomquist	CV	WTP for the preservation of Clear Creek Wetland System faced with surface coal mining investment, Kentucky	coal	WTP/household/year: $5 - $17
1993	Trigg and Dubourg	HP	Environmental costs of an open-cut coal mining proposal in North Staffordshire, UK	coal	£5,1 millions
1994	Carson et al	CV	WTP to protect Kakadu Conservation Zone from mining activity, Australia	Gold; platinum; palladium	WTP/person: AU$ 123 – AU$ 144; AU$ 52 – AU$ 81
1995	Schulze and Rowe	CV	Value of environmental damage due to past mining in the Upper Clark Fork River, Montana	copper	
1998	London Economics	CV	Calculating a tax on the output of aggregates based on the externalities generated by quarrying activity, UK	quarries	£ 4.63 per ton
1999	London Economics	CV	To investigate whether resident in UK would be WTP a tax to secure the environmental benefits that would flow from the early closure of aggregate quarries, UK	quarries	£ 10.23/year/person (= £ 0,34/ton) for those living near hard rock quarries; £ 15.57/year/person (=£1.96/ton) for those living near sand and gravel operations
	Willis and Garrod	CM	WTP for elicit compensation for the impacts of a hard rock quarry located at Aycliffe near Darlington(UK) as a means to set the level of an appropriate environmental tax	quarries	One less day of noise = £3.54
2000	Mendonça and Tilton	CV	WTP to avoid the construction of a new-scale mine in the entire Brazilian Amazon and in Serra dos Carajás	iron	WTP range from R$5.97 to R$3.92
	Heberleing et al	CM	Assessing the benefits of reducing pollution from acid mine drainage in western and central Pennsylvania, USA	coal	Analysis survey responses and analyses different non-response rates with different choice sets
	Lambert and Shaw	Agricultural production model; TC	Mining impacts on agricultural production and recreation users caused by a gold mining operation, Nevada	gold	Annual visitor values increase an average of $1,823; economic benefits of securing agricultural rights in the increased flows are approximately $1 million in net present value returns
2001	Huszar, E. J.	CV	Valuing externalities from mine dewatering	silver	Positive in the short term; negative in the long term
2003	Damigos and Kaliampakos	several	Outline the basic elements of valuation methods; presents a demonstrative example in the context of appraising reclamation scheme of an abandoned quarry site	quarries	na
2004	Ahlheim et al	CV	WTP for a reclamation project after mining to reuse the mining site for recreation, North of the City of Cottbus, Brandenburg, Germany	lignite	WTP/household/month = € 4.39
2005	Collins et al	CM	Estimate the social value of acid mine drainage clean up on Deckers Creek, West Virginia	coal	WTP/household/month = $12 - $16
2006	Damigos	CV; HP; TC	Describes two mining applications of environmental valuation methods to estimate the social benefits of mining restoration projects: Eagle River Mining and Quarry site located in the center of Athens	Zinc; quarries	Eagle Mine: desdribed in (*); WTP for the quarry reclamation with three alternatives projects: €58.20; €30.75; €49.47
	Willis	CM	Assess the public preferences for restoration planning conditions attached to an opencast coal mine in Northumberland, UK to a mixture of agriculture, woodland, nature conservation and open water	coal	na
2007	Ivanova et al	IO; stakeholder analysis; CM; experimental workshops	Assessing the economic, environmental, cultural and social impacts of additional mining activity on the local community in Bower Basin, Central Queensland, Australia	coal	na
2008	Simons et al	CV	To determine the potential impact of random contamination on the property values of yet-to-be-developed properties within the context of the former gold mine dumps in Johannesburg, South Africa	gold	The estimated average discount on the properties price of airborne mine dust and radon is 40% and 22%, respectively
	Strong and Flores	CV; cost sharing framework	Estimation of the social values of 3 restoration projects in Colorado's Snake River Watershed in Summit Countty that address acidic rock drainage	Lead; silver and zinc	Mean WTP/household/year for the 3 projects range from:$50-$62; $13-$27; $63-$76
2009	Lienhoop and Messner	CV	Estimating recreational benefits of a reclamation project of a post-mining lake district in East Germany	lignite	Mean WTP/household/year = €18.96 in the scenario 1 and €15.94in scenario 2
2010	Pemberton et al	CV	Estimating Dominican population WTP for the preservation of the natural environment for eco-tourism and agricultural activities instead of copper-gold mining activity	Copper; gold	Average One-time WTP = EC$320.78
2012	Mishra et al	TC; benefit transfer method; GIS analysis	Estimating social costs imposed by two hundred years of coal mining in Ohio and reclamation benefits	cold	Recreation loss Ranges from $0.92 million to $8.37 million;~ Recreation benefits from reclamation ranges from $0,43 million to $17.56 million
	Pelekasi et al	CV	Estimating local's community WTA a compensation for allowing the establishment and operation of a marble quarry in its surroundings	quarries	Annual compensation amount per person = € 21
	Gispie and Bennett	CM	Environmental, cultural and social benefits of the extension of an open-cut coal mine into areas that were previously identified as not economic	coal	na

CV = Contingent Valuation; CM = Choice Modelling; H = Hedonic Price; TC = Travel Cost; na = not applicable