博 士 学 位 論 文 審 査 要 旨

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論 文 題 目 ： On the Improvement of Ecological Compensation in Tibet,China:
Approaches of Social Cost Internalization and Ecosystem Services
Valuation

学 位 申 請 者 ：　　王　　　暁輝

審 査 委 員 ：

主　査：　総合政策科学研究科　　教授　郡嶋　　孝

副　査：　総合政策科学研究科　　教授　川浦　昭彦

副　査：　経済学研究科　　　　　教授　西村　　理

要　　　　旨：

　王論文は、中国チベット地域における自然保護に関する考察を試みた博士論文である。本論文
は４章から構成されている。

　第１章では、チベット地域の自然に関する地理的・社会的・経済的な特徴について論じること
から始め、２００１年の中国西部大開発戦略、とりわけ、チベット鉄道の開通によるチベット地
域と他地域との経済的・社会的関係を緊密にすることによって「自然保護と経済開発（貧困の解
消）」の両立を計る政策的展開がなされている地域であるといった論文の背景について論じてい
る。このようなチベット地域の貧困解消のためのチベット開発、すなわち、チベット地域の資源
の開発に伴う自然破壊や観光客の流入に伴う自然の過剰利用は貴重なチベットの生態系の破壊
に繋がる懸念が示される。１９７８年に導入され、１９８２年から実施されてきた中国の環境政
策は伝統的なピグー税による「生態的補償」制度であった。本論文はこのような制度の適用にあ
たって地域の自立性を前提にしてチベットにおける「生態的補償」制度の改善の提案とチベット
の持つ自然の価値についてチベット地域の生態系のもつ環境価値を分類するとともにＣＶＭ評
価手法を用いてその評価を試みた博士論文である。

　第２章では外部経済の市場内部化の手法のひとつとして中国で適用されてきた「生態的補償」
についての検討がなされている。チベットの政治的自治と経済的開放（他地域との結びつき）等
を前提にした簡単な経済モデルを用いて、チベットにおいて従来の課税公式を適用する際の改善
を提案している。チベットにおける資源開発は大気汚染や水質汚濁等の社会的費用を発生させる
が、この限界社会的費用は汚染規模を拡大する。これにより、３つの非汚染要素（外生的価格・
インフラの整備・汚染防止設備の整備）は限界社会的費用において変数化する。これらの非汚染
要素変数を考慮すると、従来の「生態的補償」制度で用いられてきた課税公式の調整係数はこれ
らの非汚染要素を反映した調整係数に改善されなければならない、というのが、本論文が得たひ
とつの結論である。

　第３章ではチベットの自然の価値を評価している。第２章が開発による自然破壊に伴う社会的
費用の市場への内部化手法としての課税方式の検討であったのに対して、本章は市場化できない

環境の価値（非市場的価値）の評価に関する検討である。環境価値を評価する方法には、様々な手法があるが、本論文では CVM 手法によってその試みを行っている。北京と上海でのアンケートをもとに、それぞれの都市の住民のチベットのもつ自然価値の評価とその社会的・経済的な特性の分析がなされている。

　終章にあたる第4章では、本論文のまとめがなされている。

　以上が本論文の概略であるが、本論文はチベット地域という具体的な地域を取り上げて、今後予想される開発（貧困の解消）と自然破壊に対して、如何にこの両立をはかるか、そのための具体的考察と提案を試みた論文である。第2章では開発による社会的費用の市場への内部化手法としての「生態的補償」制度への具体的改善の提案、第3章では自然の価値（非市場的価値）の具体的計測を行っている。それぞれの章が二つの独立した考察になっているとの見方もできるが、本論文は自然保護の観点から環境政策として市場的側面と非市場的側面の両側面について考察と提案を試みたものとして捉えるのが妥当であろう。従って、課税による収入を CVM の評価に従ってどのように配分すべきかといった問題は今後の課題となるであろう。しかし、本論文で示された研究の力量は本論文が博士論文として評価されるものであることを示している。よって、本論文は、博士（政策科学）（同志社大学）の学位を授与するにふさわしいものであると認められる。

総合試験結果の要旨

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要　　　　旨：

　２００８年１月１９日午後３時より提出された論文について総合試験を行った。
総合試験は公聴会形式で行われた。
　審査は提出された論文に対しての質疑応答とこの分野での専門知識に関する試験
および語学試験（英語）がなされた。
　試験の結果はいずれも王　暁輝　氏が博士として資格を有する研究者としての力量を
示した。
　よって、総合試験の結果は合格であると認める。

論 文 題 目 :　On the Improvement of Ecological Compensation in Tibet, China:
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Services Valuation

氏　　　　名 :　王　暁輝

要　　　　旨 :

On trans-regional spheres, this paper analyzed the social cost associated with development and the value of ecosystem services to inform policy makers to establish effective Tibetan ecological compensation scheme.

Tibet refers to the Tibetan Autonomous Region, a provincial level region of the People's Republic of China. Accounting for more than one eighth of China's total land area, the region is well known for it backward economy and vulnerable ecology and environment. In 2001, the Chinese government launched the Western China Development Strategy (WCDS) to narrow the economical gap between the eastern and western regions, and improve the infrastructure and ecological environment in the western regions including Tibet.

To Chinese policy makers, poverty alleviation and ecological improvement should be consistent goals in Tibet. Poverty alleviation program may yield economic benefit but its negative externality (ecological destruction) is necessarily internalized. On the other hand, the great positive externality of ecological improvement program is difficult to be internalized as it usually does not yield direct returns. In the absence of "social cost" and "environmental benefit", it is hard to make reasonable judgments in the process of promoting green poverty alleviation in Tibet.

In Tibet, the chance for the truly sustainable development has not yet been lost, but the opportunity must be pursued promptly and intensively to make the poverty alleviation become a part of the strategy of rendering protection to the ecological vulnerable areas especially those with great externalities. Ecological compensation has been recently brought into light by many studies as a key to translate the consistency between poverty alleviation and ecological improvement into reality, and therefore brings a win-win situation.

Establishment of ecological compensation scheme calls for a proper economical compensation paid by the local enterprises in the process of economic development for their damages of environment. On the other hand, it means the environmental protection is not a task of merely Tibet. Especially for the middle and low reaches of Yangtze and Yellow River that receive benefits, they ought to shoulder part of costs as the upstream has made their contributions to the protection of ecological environment and suffered losses. Covering theoretical and empirical issues, this paper presents innovative and rigorous frameworks for analyzing the questions arising in the establishment of the Tibetan ecological compensation scheme.

The intent in this paper is twofold. Specifically, the fist part attempts to answer the following questions: How much polluter should pay if the environmental damage from exogenous non-pollutant factors is considered? Is the current implemented pollution levy (compensation fee) system effective?

The Qinghai-Tibet railway extends Tibet to the outside market. Exploration of natural resources along the world's highest railway is significant to the railway's efficient use, regional economic development and meeting China's resources demand. On the other hand, the exploitation of natural resources generates social cost into the Tibetan environment.

Pigou provided means for internalizing the social cost associated with pollution. The standard Pigouvian solution calls for a levy on the externality generating activity equal to its marginal social cost. In Tibet, it is difficult to compare the levy with the marginal social cost because the environmental damage originating from various non-pollutant factors varies significantly as the implementation of the WCDS. It is necessary to estimate with precision how much the polluter should pay when their marginal production cost and social cost depend very much on the basic facilities and pollutants treatment facilities installed in Tibet. Moreover, good economic policy suggests that identifiable environmental cost to be internalized on a condition of the steady price. Confusion will arise when the national market price for the resource is exogenous and easy to verify, because the price does not reflect the social cost incurs to the resource exploitation and might sign a comparative advantage encouraging excessive exploitation.

In this part, a simple economical model is built, in which three non-pollutant factors are represented, to obtain an expression of the optimal pollution levy for regulating the negative externality released into the Tibetan environment of producing a national consumed resource. Given the fragileness of the Tibetan environment, it is reasonable to state the marginal social cost increases in the scale of pollutants. Then, non-pollution factors become variables in the presence of the marginal social cost. As a result, an increase in national market price increases the pollution levy and an upgrade in infrastructure (pollution treatment facility) increases (decreases) the levy.

The result has important policy implications that there is still a considerable room for improving the effectiveness of the current pollution levy through integrating non-pollutant indexes into the levy calculation. For water and air pollutants incur to resources exploitation, a set of formulas are prospected to estimate the levy. Proportional expressed adjustment coefficients taking into account the variations of non-pollutant factors have been inserted into the formulas to match the circumstance in Tibet. The advantage of employing such pollution levy system is its small policy cost. In practice, policy regulators may observe fluctuations in each non-pollutant variable and compute the ratio. The value of each proportional expressed coefficient may vary significantly as China's demand for raw material resources soaring and the implementation of the WCDS, and therefore vary the levy.

Furthermore, since exogenous market price for raw material is easy to verify, an ad valorem approach, which entails higher information cost is introduced to achieve more precisely approach to the marginal social cost. Dominant policies are also prospected, when the marginal social cost is subject to the shifts arising from the other non-pollutant factors in addition to price. For policy maker, the regulatory problem involves the estimation of unobservable coefficients. The burden of the information to implement such pollution levy may bring potential gains through more precise approach to the marginal social cost.

The second part of this paper attempts to answer the following questions: Are the Tibetan ecosystem services valuable to the downstream people? If they are, what is the appropriate policy option?

Tibet is characterized by geographical and cultural uniqueness, which are viewed as

constraints of development, there are comparative ecological advantages offered by the very nature of the plateau's natural conditions. Some benefits of the Tibetan ecosystem services go to the local communities neighboring the area, and some are important for China, and some benefit the entire globe. Ecological compensation mechanism according to the principle of "who protection, who benefit" and "who benefit, who pays", actually indicates a redistribution of interest between beneficiaries and the compensation receivers.

At present, ecological compensation in the Western China faces the shortage of fund which makes divorce between the beneficiaries and compensation receivers. The central government neglected the earring lose suffered by local government and farmer, and the benefits of the ecological improvement projects, does not fully compensate its ecological contributes, but makes it works more tough and strains its financial budgets.

A critical issue to effective ecological compensation scheme is the proper valuation of ecosystem services. With in-depth recognition of the value of ecosystem services, various forms of ecological compensation cases appear all over the world, and most of them have obtained ideal results of economical and ecological benefits. Using contingent valuation (CV) approach this part makes an attempt to elicit non-users' values that the residents in Beijing and Shanghai hold for the world highest city wetland (Lhalu wetland).

Following the National Oceanic Atmospheric Administration panel guidelines as closely as possible, the CV survey suggests a majority of the respondents in Beijing and Shanghai who are far removed physically from Lhalu wetland were willing to pay to support the wetland preservation efforts. Welfare measurements are derived based on the parameter estimation of logit models. The frequency analysis results elicit a mean annual willingness to pay of 126.78 and 111.29 CNY, for Beijing and Shanghai respectively. Expanding the sample values to population, this paper calculates a conservative estimation that Beijing and Shanghai residents may yield around 774.792 and 535.026 million CNY annual funds respectively to conserve the area in question.

Nevertheless the use of CV in the valuation of environmental goods and services in China is rare and there is still uncertainties regarding the accurate benefit that CV derived, logical statistical results are obtained when the application of this method in the Tibetan wetland ecosystem services valuation. The economic values derived from the survey reflect the social preferences and can be of use in policy making, as the assessment of the management options can be based on these values.

An operational alternative option that policy makers can employ is the spontaneously organized compensation, that is, the one-to-one compensation between a developed region and Lhalu wetland. A successful case is the clean water supply transaction between New York and the upstream in the watershed. Adopting this approach between Beijing and Lhasa, among many expenditure preferences, Beijing residents are willing to pay 144.11 million CNY to compensate the approximate 1,750 employees who live in Lhalu wetland protected area. That is annually 82,348 CNY per employee, nearly 3 times to 28,950 CNY per employee in Tibet. This is an approach to integrate environmental goals into poverty alleviation. Further research should attempt to expand the use of the CV or other methods to determine more reliable estimates of direct use values of the Tibetan ecosystem services, such that, cross-regional comparison can be made and based on the analysis of ecosystem production service, the scope of compensation for the main entity to receive such compensations can be precisely determined.