A GREAT TRANSFORMATION: RESETTLEMENT POLICIES, INSTITUTIONS AND METABOLIC PATTERNS IN THE TIBETAN RANGELANDS

Presented by Jampel Dell'Angelo , visiting scholar at the Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis

email: jdellang@indiana.edu

Abstract: This case study focusses on the environmental governance dynamics of the Sanjiuangyuan area in the Tibetan Rangelands in Qinghai and its consequences on the nomadic population. This particular area of the Tibetan-Qinghai plateau contains the watersheds of three of the most important rivers of Asia: the Yellow, the Yangtze and Mekong rivers. Official media report that as a response to the persistence of drought-flood phenomena of these rivers, PRC's Central Government has implemented major policy measures and allocated substantial funding. One of the crucial aspects of these environmental policies is the objective to resettle and sedentarize the nomadic population. Therefore, Tibetan nomads' life style, mobility patterns, production system, institutional arrangements and metabolic patterns are going through a dramatic change. In this research I apply the IAD, integrating Institutional Analysis, Political Ecology and Societal Metabolism bodies of scholarship, in order to investigate and explain this complex issue.

1. INTRODUCTION

The term nomad[1] comes from the ancient Greek verb "nomadein" which literally means "to herd the flock to pasture". This philological root contains an essential description: 'movement' and 'animals' represent the two fundamental pillars of the nomadic dimension. Pastoral nomadism, as a mode of production and a form of life, is steadily disappearing all over the world on account of political, economic, demographic and historical processes that began at the end of the 19th century and were consolidated during the 20th century (Sandron 1998). The literature on nomadic communities in different areas of the world identifies a common and relevant influential factor: the rise of modern states and the extension of various forms of state control and governmentality have drastically transformed nomads existence (Goldstein and Beall 1991; Klute 1996; Lenhart and Casimir 2001; Miller 2000; Pirie 2005; Salih 1990). This phenomenon has been extensively investigated where Africa is concerned, while the Tibetan-Qinghai plateau, which is one of the areas that have one of the highest percentage of nomadic population[2], has not receive similar scientific and research attention. The reasons for Tibetan pastoralist to be under-investigated can be mainly related to the fact that conducting social research in Chinese politically sensitive areas is forbidden.

Since 1959, when the Chinese government took military direct control over the Tibetan areas, the nomads have been subjected to different policies that aimed at governing their mode of production. However in 2003 that the Chinese Government started a new round of policies explicitly aimed at resettling and sedentarizing the nomadic Tibetan population (HRW 2007). These policies have been implemented in different Tibetan nomads populated regions, but in Qinghai they have been implemented with a particular persistence. Initially the resettlement policies have been presented as solutions for specific problems mainly related to overgrazing and rangeland degradation and only for small shares of the nomadic overall population. However in 2010 the Chinese Government stated that the resettlement of the entire Tibetan nomadic population is a policy priority.

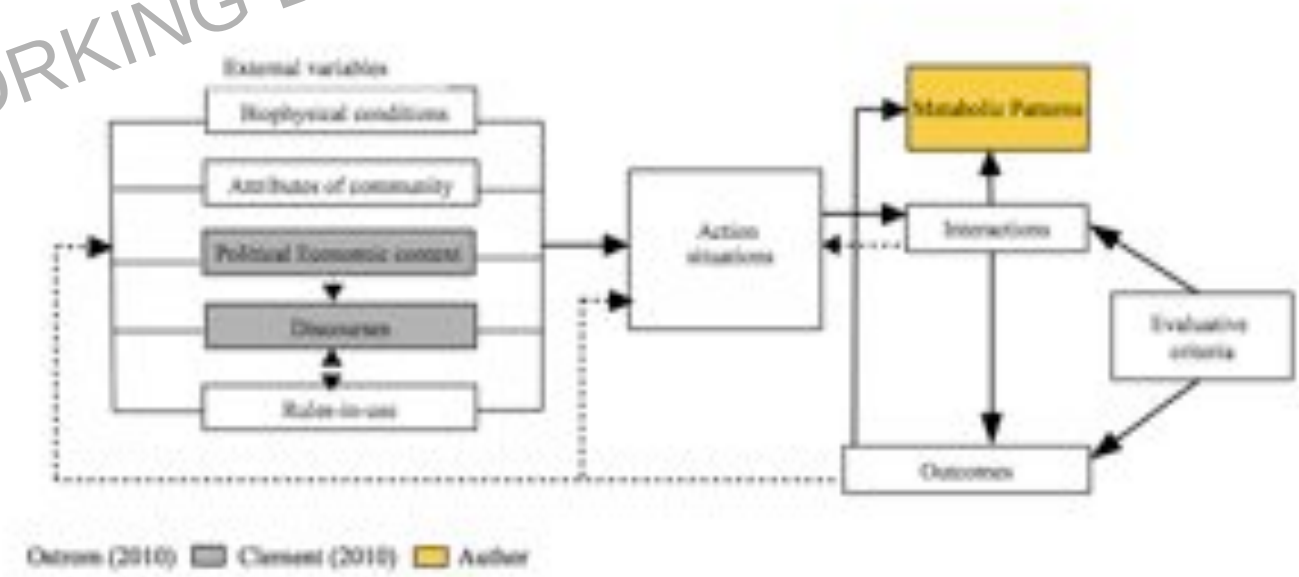
This paper investigates the environmental governance of the rangelands in the Tibetan areas of Qinghai, China. It examines the patterns of interaction between traditional and Chinese governance institutions within the Tibetan nomads socio-ecological system with a particular attention to the recent phenomenon of resettlement and sedentarization policies. In this research Institutional Analysis, Political Ecology and Societal Metabolism bodies of scholarship are brought together to develop a comparative institutional analysis between a traditional nomadic village and a resettlement site. The different outcomes of the two systems are investigated and the following research questions addressed: i) how are the Tibetan rangelands governance institutions changing as a consequence of the central government policies? ii) what are the main discourses and narratives behind the resettlement policies? iii) What socio-economic and metabolic differences between a traditional village and a resettlement can be highlighted? iv) is it possible to apply the evaluative criteria 'sustainability' to this complex issue?

[1] The terms "Nomads and nomadism" in this context are referred to the pastoral mode of production which is the prevalent form of nomadism in Tibet. Also, in the Tibetan language the word *'brogpa* is translated into English as "nomad", literally meaning 'that rangelands in the mountains' (Orofino, 2003).

[2] If calculated against the Tibetan population…(XXX)

2. METHODOLOGY AND METHODS

The Institutional Analysis Development framework (IAD) has been extensively used for the study of common pool resources (CPRs) and common property regimes in the field of natural resource management (Oakerson 1992; Agrawal 1999; Ostrom et al. 1994; Ostrom 2000, 2005) but also for other complex interdisciplinary research tasks, for example the study of government incentives, the analysis of institutional impacts on monitoring and evaluation in development projects (Gordillo and Andersson, 2004) and institutional analysis of reforestation policies (Clement 2008). The IAD framework is used in such a large variety of empirical settings because it is helpful for identifying and rigorously analyzing the structure of a situation, in particular the influence of the rules, the essential characteristics of the actions and events taking place and the main actors, subjects, and communities involved (Ostrom, 2005). However, a recurrent critique of institutional analysis is that does not highlight the role of power and politics. To address this limitation, Clement (2010) proposes a modified "politicised" version of the IAD that takes into account the assessment of policy change and policy impacts, across multiple levels of governance (Clement, 2009, 2010). Here in this case study a further modified version of Clements IAD framework is used, which makes it possible to integrate analysis of multiple governance levels (IAD) and to include political aspects of the structuring (Clement, 2010) transmitted through discursive practices (Hajer, 2005). Moreover in order to take into account the biophysical aspects of the case studied, drawing from the literature on Societal Metabolism (Giampietro 2003, Giampietro et al., 2009) the dimension "Metabolic patterns" was added to the framework.



A case study approach has been adopted here, in particular because understanding the institutional arrangements of the local nomadic community requires study of rules that often are not written and difficult to conceptualize from within a non-nomadic logic (Beckmann and Padmanabhan, 2009). The fieldwork was conducted in two phases, first from June-July 2007 and then from September-October 2011. During the first phase 67 in-depth interviewed were conducted and 75 in the second. The first and the second field works were conducted following a similar research approach but with some important methodological and contextual differences. The provinces where data was gathered in 2007 and 2011 were different. During the first phase a wider variety of people were interviewed, in order to get a picture of the general aspects of the resettlement issue. Moreover in 2007 the political tensions in the Tibetan areas were looser and it was possible to interview government officials while in 2011 this was not feasible. During, the second fieldwork in 2011 most of data collection was conducted in one specific 'traditional village' and in two resettlement sites (that will be kept anonymous). One of the characteristics of the traditional village studied is that the summer pastures are in common and the institutional arrangements for the management of the common land of the village are shaped by rules decided at the village level.

The case study incurred in some research limitations and constraints. The Chinese government does not authorize research in Tibetan areas on contemporary issues. Moreover the government considers the resettlement programs a very politically sensitive issue. The political sensitivity and high level of control makes it particularly difficult to gather information without putting your informants in a problematic situation. Exacerbation of political tensions following the 2008 Olympics and the self-immolations of Tibetan monks, which started in 2011, made the research conditions even more difficult. This constrained what methods could be used to gather information, as well at the time that could be spent in interviews and direct observation and the possibility of requesting and receiving information from certain actors, such as government officials. The selection of the interviewees, in this context, was a very important and delicate issue. For this reason, the initial plan of using questionnaires in the second field work was abandoned. The data gathering that was possible was via in-depth interviews, supported by three different interview guides (see Annex I). The interview guides used in the second fieldwork designed to

capture three categories of information: 1. Resettlement and environmental policies; 2. Village level land tenure institutional arrangements; 3. Household metabolism.

Apart from the traditional systems of communication a commonly used mean of policy information dissemination in the Tibetan rural areas is posters. For this reason posters represent an interesting object to support study of how shared understanding is produced and how the transformation of this understanding is employed and exploit for policy making and implementation (Hajer 1997). All the policy posters that have been encountered during the two fieldworks missions have been photographed and their contents analyzed. This provided the possibility to understand the discourse that the government diffuses in the remote nomadic areas. Moreover it has been possible to understand the evolution of the discourses from 2007 and 2011 and look at this in relation to the evolution of the resettlement policies.

3. MODIFIED IAD ANALYSIS

Action arena

The focal level of analysis of this case study (i.e the action arena) is the 'governance' of the rangelands. The action arena is the conceptual unit that coincides with the main focus of analysis in the IAD. In a complex socio-ecological system the action arena is the holon that the researcher can investigate in order to better understand and get insights on the functioning of the system. The holon *action arena* is made of two other holons, the *action situation* and *actors/participants* that interact (Ostrom 2005). In the original version of the IAD (Ostrom 1994) the action arena structure is affected by three clusters of exogenous variables the <biophysical conditions>, <the attributes of the community> and the <rules>. However, considering the nature of the issue analyzed, three clusters have been added for the application of IAD to the current case study: the cluster <metabolic patterns>, following Giampietro et al., (2009) and following Clement's work (2009, 2010) the clusters <political economy context> and <discourses>. Within an action situation, Ostrom et al (2005) recommend that one consider seven types of variables: 1. participants, 2. positions, 3. Actions, 4. potential outcomes, 5. information, 6. transformation functions, 7. payoffs (Ostrom et al. 2005). In this case study the actors/participants has been restricted to two categories the Tibetan nomads (the community) and the Government. This is a simplification that does not consider the diversity of actors (ie. village leaders, women, elders, young, Chinese officials, Tibetan officials, county, province, region, central government officials, NgOs experts, scientists etc) that is consistent with the selected level of the analysis, to compare how the consequences of the resettlement program are experienced by, respectively, Tibetan nomads and the Chinese government authorities. Fundamental aspects of the 'governance of rangelands' that have been considered in the case study are: a. who is allowed to harvest resource units, timing quantity, b. technology and location of harvesting, c. how harvesting activities are monitored, enforced and sanctioned, d. what are the conflict resolution mechanisms involved with appropriation activities, e. what is the role of the rules, f. what strategies are used by the participants (Mwangi and Ostrom 2009).

Political economic context

The political economic context is a fundamental element of the analysis. The political aspect in the Tibetan issues is so strong that affects the most basic daily life elements of the Tibetan people. The research itself had to take into account strong political limitations. Also in this case the analysis of the political economical variables had to be restricted to a subjective selection that included as main variables: i) historical events: (mainly the policies that followed the Chinese occupation in 1959); ii) China's recent economic growth; iii) global modernization forces (including ecological modernization, technological innovation). The People's Republic of China is going through an unprecedented change in terms of speed and scale. The rural areas of PRC are a fundamental target of the Government's economic strategy. In particular the western areas, with the highest levels of ethnic minorities, rural activities, and lowest

economic performance indicators are a fundamental target for the country's social and political stability. In particular the Tibetan question is perceived and represented as a threat to national security and cohesiveness and the economic development as a remedy. In 1999, Premier Jiang Zemin's slogan "Open Up the West through rebuilding a green west" announced one of the priorities of China's development strategy. The Central Committee of the Communist Party of China approved the "Open Up the West" campaign stating the intention to develop the economy and reduce the economic and infrastructural gaps between the rich East and the poor interior provinces. The central points of the development strategy, synthesized as (Holbig in Goodman 2004): embracing sustainable development, reducing regional income inequalities and foreign investment; implementing infrastructure development; tackling turbulent issues for minority nationalities.

Discourses

In this political economical context, according to the Chinese government narrative the environmental protection of the grasslands and watershed and the socio economic development of the Tibetan nomads mode of production become the two sides of the same win-win coin. The resettlement policies have been implemented with the support and through the creation of clearly defined discourses on the importance of the Tibetan grasslands for the hydrological security of China, on the proposition that there is severe environmental degradation produced by nomadic activity, and on the argument that it is necessary to modernize the backwardness of the nomadic population. These discourses have been promoted by the official media, and with a diffuse use of propaganda posters in the rural and more remote areas. Discourses, intended as "a specific ensemble of ideas, concepts, and categorizations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities" (Hajer, 1997:27) extend their presence in the nomadic areas through a large diffusion of posters. The posters address concepts that are always ascribable to policies at the provincial, regional or national level. The analysis of the discourse of the posters observed in the first and the second field work revealed different narratives. In 2007 the central discourse was the restoration of grasslands and the protection of the watersheds, with a specific attention the Sanjiangyuan area protection. In 2011 instead, the education of the nomadic population was the core theme of the posters that were observed.

Table. 2: Discourses variation

	Percentage of posters with this theme	
Discourse content	**2007**	**2011**
Environmental Degradation	91%	5.8%
Poverty alleviation	5%	14.7%
Education	4%	73.5%
Population control	0	2.9%
Gender equality	0	5.8%

Rules in use

In order to identify the main features of the institutional arrangements involved with the nomadic mode of production in the study area, it has been useful to first analyse the variations happened from before 1985 till the present.

Box 1. Historical reconstruction of institutional arrangements in the Tibetan rangelands

	Land use: (winter, autumn, summer pastures)	**Livestock property**	**Seasonal moving**	**Rules**	**Housing & Transport**

Before 1958	Shared between people of the same tribes (township)	Family	Moving in 3 different rangelands for the 3 different seasons	Non written customary rules, Battles between different tribes, peacekeeping role of Lamas	Black tent all year Horses
1958-1962 (Peaceful Liberation Army Occupation)	Shared between people of the same township	Village	Moving in 3 different rangelands for the 3 different seasons	Chinese Military and officials-> Village leaders	Black tent all year Horses
1962-1964	Shared between people of the same township	Family	Moving in 3 different rangelands for the 3 different seasons	Chinese Military and officials-> Village leaders	Black tent all year Horses
1964-1980 (cooperative time)	Winter land was divided by groups. Summer and autumn land by townships	Group	Moving in 3 different rangelands for the 3 different seasons	Chinese Military and officials-> Village leaders and group leaders (they decided what work the people had to do many people sent to construction)	Black tent all year but all together putting the tents in circle Horses
1980-1999	Winter land was divided by families Summer and autumn land by village	Family	Moving in 3 different rangelands for the 3 different seasons	Chinese officials	Black tent all year Horses
1999-2011	Winter, summer land divided by family with a 50 years use right document from government (Fencing) RESETTLEMENT POLICIES	Family	Just changing the winter and summer pasture no transhumance	Discussed in the text.	Houses And Motorcycles

Following Ostrom's (2010) explanation of rules as exogenous variables directly affecting the elements of an action situation rules, these are understood in this analysis as the set of instructions that define and influence an action situation in a specific environment (Ostrom 2005). The analysis of the case study has been conducted (see Table 3) referring to the following categories of exogenous variables: boundary rules, position rules, scope rules, choice rules, aggregation rules, information rules and payoff rules (Ostrom 2010). The action situation under analysis is the one that relates to access and use of the grasslands. The problem with identifying working rules is that large part of the information is implicit and non-written and often not conceptualized by the actors. There are several decision making levels[3] in the analysis of this case, with two different levels that are more representative: the 'Government level' (that refers to rules and decisions taken at Central government, regional and county level) and the 'Village community level' which is the unit that most coincides with the traditional nomadic institutions. The boundary rules define the boundaries of the population that access the resource. In the studied case Tibetan nomads are accessing rangelands. There is an ethnic component here to the socio-economical performance within the action situation. Chinese han and Chinese Muslim[4] are not present in the pastoral activity. However, the new

[3] Central Government, Regional Government, Province, County, Township, Village, Household

[4] there are very few exceptions like in..

government policies seem to open the space for a different kind of exploitation of the rangelands by new actors, such as minerals extraction and logging companies. The position rules are the ones that define the position that an actor has in a certain situation. In the case study, the position that the actors hold depend on the hierarchical level of the decisions taken. The Tibetan nomads, arrive only at the village government level. Nomads (only men) participate to village assemblies. There is no representation of nomads in the higher levels of decision-making that affect the land access rules. Scope rules represent the limits that the actors (appropriators) implicitly or explicitly respect when using the resource. From the information gathered for this case study, the nomads tend to respect the traditional village and inter-villages rules rather than the ones imposed by the government policies. Choice rules include the rules that bring together technical knowledge with resource use. Also in this case there is a strong divergence between traditional knowledge and government experts knowledge. The most important case is the indicators the nomads households, families or villages use when deciding how long to graze, as compared with the government decision to ban the land and restrict the numbers of animals. Information rules mainly define what kind of information can be revealed and what should be shared. In the case study it has been observed that the level of shared information within the village is very high. Tibetan nomads in the village don't have incentives to keep secret related to land tenure and grazing from each other. In the case of the information between government officials and nomads instead there is an incentive on both sides to keep secret information. This spans from the number of animals possessed, the income generated on side to a non-disclosure of the real reasons behind policies decisions. Payoff rules are related to the sanctioning systems of the previous rules. At the government level sanctions can vary from fines, to confiscation of animals to arrest. At the village levels instead, not respecting the rules is an issue discussed in the village assembly and resolved without the judicial intervention.

Table 3. Comparison of working rules between traditional nomadic village and resettlement site

Working rules for rangeland use:	'traditional nomadic village X' Tibetan rules	'resettlement site X' Chinese rules
Boundary rules	▪ The only herders that can access the common land of the village are the nomads from the village	▪ The nomads in the resettlement cannot access the pastures ▪ No decisions are taken in the resettlement on the land management and access
Position rules	▪ All the male adults participate to the village assembly. ▪ Village committee composed by 5 people (2 village leaders, 2 members and village committee members and 1 accountant)	▪ There is no assembly where decisions for the whole resettlement are taken ▪ There are group leaders which are representative of the people from the different villages in the resettlement
Scope rules	▪ The village assembly decides when to use the common pastures and for how long ▪ There are no violations of the decision of the village	▪ The nomads know that they can be fined if they access pastures ▪ If the nomads have the possibility they will herd illegally

	assembly	
Choice rules	▪ Rules defined for the techniques for the caterpillar fungus harvesting in the common village land. ▪ Traditional norms define pastoral activity techniques	▪ Government officials implement settled ranching programs
Aggregation rules	▪ All the decisions on the common pasture are first discussed in the assembly	▪ Decisions are imposed by the government
Information rules	▪ The level of shared information in the village is very high and the possibility to verify as well.	▪ Information is often kept secret on both sides. Nomads are often producing illegal activities. The government does not reveal the real reasons and time of the programs.
Payoff rules	▪ Breaking of rules is first discussed in the village assembly and elders are called to decide. ▪ Monitoring is easy	▪ Government imposes sanctions like fines, confiscation and arrest but the possibility to monitor is reduced

Attributes of the Community

The definition of community can vary according to the context and the interpretation of the researcher. In the case of CPRs it generally coincides with the group of appropriators/resource users. According to Ostrom (2005) the attributes of the community that influence the action arenas include: the composition and size of the considered community; the understanding and information that the members of the community share about the analyzed action situation, the distribution of resources and level of inequality between the members; the level of homogeneity in the preferences of the members of the community; the values, norms and behaviours accepted or rejected between its members. In the studied case it is possible to refer to 'community' when speaking of the overall category of Tibetan nomads because it has very homogenous characteristics. However, the most useful unit to analyze is the village, also if in some cases this can be just an administrative construction, for example households of the same family group can be part of different villages, households of the same village can live in different valleys or households from different villages can live in the same valley. But when it comes to decisions regarding the rules related to the rangelands the village level is where the action is. In Qinghai, according to 2004 statistics there were approximately 583.500 people living in pastoral areas (FAO 2005). The large majority of people living in pastoral areas are Tibetan nomads, with 200 000 nomads counted and just in the Sanjiangyuan area. The size of a village can vary but usually as they are administratively designed the range is between 500 and 2'000 people. The interviews revealed that the level of information and awareness of the grassland governance issues is very high and often discussed between the family members, the groups and inside the village assemblies. The Tibetan nomads traditionally consider themselves 'poor', 'medium' or 'rich' according to the number animals owned by the household, while the size of the land owned is usually

not an indicator of the families' wealth[5]. Inequality has been reduced with Chinese redistributive policies however levels of economic inequality have been observed in the fieldwork. According to the interviews a household with less than 10 Yak is considered 'poor', with more than 20 and less than 40 'medium' and with more than 40 'rich'. In the studied village the distribution of rich medium and poor was averagely around 1/3. The cultural homogeneity of the Tibetan nomads is very high. Traditionally the Tibetan nomads are considered as very religious and all the interviewees answered that Buddhist practice and religious activity are a fundamental aspect of their life. The Buddhist beliefs were according to all the interviews the common ground for ethics and behavior. Interestingly, the elders complain that the young generations do not have the same faith that they used to have but when interviewed people younger than 30 years old they would still answer in almost all cases that Buddhist believes and karma[6] influence their life. The most relevant aspect of the preferences related to the considered action situation was if nomads were looking forward to the resettlement policies or if they were happy with their nomadic life. Over 95 % of the interviewed people revealed that they did not want to move to the resettlement and preferred to live their life in the grasslands. The small percentage of people that declared that they were happy about the resettlement were elders that didn't have family members to take care of them, but also in this case they answered that they missed the life in the rangelands. Finally a fundamental difference that emerged between the traditional village and the resettlement is the level of cooperation. In the traditional village every interviewed household declared that they could rely on cooperation with members of the same village for several group activities such as house building, black tent making, taking care of children and harvesting activities. Also the social trust in the village appeared very high and most of the members declared to know everyone in the village and "had their doors open" for people to come. On the contrary in the resettlement sites the level of cooperation changed. The resettlement are mixed with households coming from different villages. As a result cooperation in the resettlements is limited to the households from the same villages and there are very little social relationships between people from different villages. In the resettlement the level towards the other members appeared low and the interviewed people declared in most of the cases to be afraid of thieves and damage to their properties.

Biophysical Conditions

When applying the IAD framework to the understanding of a complex socio and ecological system there are a huge number of biophysical variables that could be taken into account in relation to the rules in use and the attributes of the community (Ostrom, 2005). For this reason the choice of these variables is subjective. The aspect of subtractability and excludability of the rangelands varies according to the institutional arrangements established during the different historical and political periods. However wit is possible to define that during the years, for several causes (i.e. demographic pressure, ecological disturbances, policy and institutional arrangements) the level of subtractability and excludablity of the rangelands increased. The choice of the biophysical attributes considered in this analysis has been restricted to: i) land degradation; ii) population variation (of humans and livestock); iii) seasonal changes. Land degradation is the first biophysical element that needs to be considered in the analysis of the patterns of the nomadic mode of production. Government national policies, local authorities and interviewed nomads all give a central importance to land degradation. PRC's central government states that grassland and pasture degradation of Qinghai-Tibetan plateau is the main threat to the health of the watersheds of the three most important rivers of the country: the Yellow, Yangtze and Mekong. Local government authorities and village decisions organs have been acting in relation to the issue of land degradation and most of the nomads interviewed (above 80%) during the field work have expressed concern for land degradation and soil erosion (problems with the skin of the land). However the scientific explanation for this phenomenon is not well documented.

[5] However this changed with the recent boom of the harvesting of the caterpillar fungus

[6] explanation of Karma (xxxx)

Government officially states that overgrazing and proliferation of *pikas*[7] are the fundamental causes. This statement is supported by very few data and debated by opposing positions in the scientific international literature (XX). Population patterns are another very controversial variable in a country that implements restrictive population control measures and with a strong historical-political conflict. In the case of human beings two radically different positions can be found both in scientific and general literature. Tibetans in the Diaspora, Tibet support groups and usually western observers and researchers report that Han Chinese and Muslim Chinese are surpassing the Tibetan population in Tibet through extensive and government supported migration. It is possible to find the terms 'population' or 'demographic invasion' in relation to this issue (Fischer 2008). Moreover, Tibet support groups denounce that forced abortion and sterilization of Tibetan women has been implemented in more circumstances in public hospitals. On the other side the official position of the Chinese government is that Tibetans, being an 'ethnic minority', have fewer constraints on their reproductive possibilities. Tibetans as all other ethnic minorities in China, are allowed to have 2 children per family in urban areas and 3-4 children in rural areas, against non ethnic minorities (i.e Han Chinese) which have to respect the 'one child policy' . Animals demography regarding sheep and Yak stocks is not less controversial. The official statistics are recorded by the prefectures Animal Husbandry Bureaus, however there is no homogeneous statistical record of the number of animals per region per year. Furthermore, there are strong doubts regarding the data gathering methods and the validity of the accessible data because of the incentive of the herders to not declare the real number of their animals to government officials because of restrictions on the number of permitted animals and the fear of confiscation (Sneath 1999). Seasonal patterns are another fundamental biophysical attribute for the nomadic activity. Traditionally the mobility of Tibetan nomads followed the four seasons transhumance mobility patterns. For each season a pasture with different altitude would have been appropriate (Norbu XX). This has been the mobility system till Chinese annexation. At the moment nomadic families mobility patterns have been strongly modified by government and local institutional arrangements but still the livestock cannot graze for 12 months the same area. Generally nomadic families now have a 'winter' and 'summer' pasture. In certain cases the winter and summer pasture corresponds to different altitudes and the rotation is also related to snow coverage while in other cases it is just a symbolic definition and the only purpose is land rotation. The climatic conditions are however a fundamental determinant of the pastoral mode of production. Although there is a diffuse narrative and an increasing scientific attention on climate change effects on the Qinghai-Tibetan Plateau (Harris 2009), evidence on the relationship between climatic patterns and nomadic activity is not present in the scientific literature.

Metabolic patterns

Analysing the socio-ecological metabolism in a traditional village system and in a new resettlement system revealed important information for understanding the transformations produced by institutional arrangements change as a consequence of government resettlement policies. The analysis of socio-ecological metabolism has its theoretical roots in the work of authors such as Liebig, Podolinski, Lotka, Prigogine and Georgecu-Roegen (Giampietro et al. 2000). It understands the relationship human-nature as constrained by entropic laws in a system that is complex and dissipative. This analysis focuses at the 'village level' which is the unit choose for the action arena study. Looking at some of the crucial aspects of societal metabolism in the two systems studied - the 'traditional village' and the 'resettlement site' - some patterns and trends can be identified for the following categories: time, land, energy, materials, nutrition, water, human activity, mobility and information.

Table. 4 : comparison of Socio-ecological metabolic patterns, evidence from the field work 2011, mean of the results**.**

[7] Explain what are pikas

	'TRADITIONAL VILLAGE X'	RESETTLEMENT SITE X
Time	▪ Over 80% of daily human activity for pastoral activity	▪ Over 60% of daily human activity not employed
Land	▪ 400 mu per household for the winter pasture ▪ 30 000 mu in common for the summer pasture	▪ Pastoral land access is banned ▪ 0.5 mu per household for all year
Cattle	▪ 'rich' household: X > 40 yak and X>100 sheep ▪ 'medium' households: 40 > X > 20 yak and 100>X>30 sheep ▪ 'poor' households: X<20 yak and X<30 sheep	▪ physical restrictions for a maximum of 5-10 yak and 10-20 sheep
Energy	▪ Heating: 100% from Yak's dung ▪ Electricity: For summer pastures: PV panels; for winter houses electricity bought from the government ▪ Transport: 100% of fuel for motorcycles bought on the market	▪ Heating: over 60% from coal bought on the market ▪ Electricity: electricity bought all year round. ▪ Transport: 100% of fuel for motorcycles bought on the market
Nutrition	▪ Over 90% of food consumed self produced ▪ Daily meat consumption ▪ Traditional dietary habits preserved	▪ 70 % of food consumed bought on the market ▪ 20 % of food consumed received from family members from non resettled HH. ▪ Weekly meat assumption ▪ Increased consumption of rice and cereals
Water	▪ Available in the houses in winter pastures ▪ During the summer only in the springs	▪ Available in the houses all year round
Income in the HH by human activity	▪ 60% Pastoral activity ▪ 35% Caterpillar fungus harvesting ▪ 5% Agriculture	▪ 50 % government subsidies ▪ 35 % physical work wage employment ▪ 15% small business
Mobility	▪ Seasonal transhumance from the winter village to	▪ No systematic mobility patterns

	the summer common land	
Information	▪ Traditional knowledge preserved through practice and oral communication	▪ Loss of traditional knowledge ▪ Increased external information inputs ▪ Increased schooling access

In the resettlement system land access is heavily restricted, with bans that initially were established for 10 years but that in many cases become permanent because of the impossibility of the households to return to the grasslands once they don't have their flock anymore, which is generally the case when households move to the resettlement. Nomads move from a pastoral mode of production and reproduction to a system where they do not have control on their resources and means of production. The way nomads use their time is drastically transformed in the resettlements and they move from a situation in which very little time is not employed in some pastoral activity (there is here a gender differentiation that is maintained in the resettlement), to a situation in which most of the time is spent without an activity. Work in the resettlement becomes wage work with nomads employed for construction work but often unemployed. All the energy, material, water, and nutritional inputs become in the resettlement external, and the household moves from a self-subsistence economy to a market dependent one. The Government subsidizes the resettled families, which in all the interviews declared that do not receive enough money for eating and heating their houses. The nutritional aspect is according to the interviews particularly important as the resettled nomads constantly declare that the reduction of the meat in their consumption pattern is a big reason of concern. Mobility patterns are completely transformed, the issue of sedentarization, depends on the fact that the nomads stop moving their flock with seasonal transhumance. Information flows change as a consequence of the process of schooling that is extensively implemented with the compulsory education system. It is important to point here the critique to the education policies in Tibetan areas which prioritize Chinese over Tibetan language. The traditional ecological knowledge which is practiced in the pastoral system is not put in practice in the resettlement.

Patterns of interaction & (Policy) Outcomes

The Chinese government has influenced the governance of the Tibetan rangelands since 1958. However in the period starting from 1999 relevant structural changes in the rangeland SES governance system occurred. A fundamental policy decision has been in 1999 the redefinition of land use rights. The Chinese government, assigned to each nomadic household a 50 years land use right for winter and summer pastures. This policy decision taken at the PRC's Central Government level for all Tibetan nomadic areas, drastically changed the landscape of Tibetan rangelands. Two main phenomena have been produced, first the fencing of households pastures. Second, the construction of houses. This policy changed the mobility patterns of the nomads and incentives sedentarization, but did not eradicate the nomads from the rangelands. In 2003, instead resettlement policies started to be introduced. The main difference with the previous programs was that these policies were not only aimed at sedentarizing the nomadic population but also at relocating it and concentrating in resettlement sites, moving them away from the grasslands and reducing the numbers of animals. The resettlement policies from 2003 to 2009 were officially developed for the purpose of grassland protections and restoration and involved animals reduction and in most of the cases up to 10 years land use ban. In Qinghai the government launched the 'ecological migration program' in 2003, (HRW 2007) and rapidly resettled in concentrated settlements 28 000 thousand nomads from the core of the Sanjiangyuan area. The year after in 2004, the Government announced the intention to move another 43 600 people from the Sanjiangyuan area and create a 'no man's land' (*wurenqu)* for

grassland protection. In 2010 then, the Government declared that the programmed plan for the Tibetan rangelands in Qinghai was to resettle and sedentarize the entire nomadic population (Xinhua 2010). The different resettlement programs in Qinghai such as the "*Ecological Resettlement"* and the "*Nomadic Settlement"* (interviews, Ptackova 2011) are a fundamental part of the environmental protection of the Sanjiangyuan area. The environmental protection has been described on various occasions as one of the backbones of the "*Open up the West"* agenda (Goodman 2004).

Evaluative Criteria

One of the criteria that is most used in the IAD literature for evaluating socio-ecological governance systems and resource extractions pattern is 'sustainability'. However, the term 'sustainability' especially as an evaluative concept is loaded of normative value and cannot be used in a neutral way accepted by the different social actors involved in the same action situation but interacting in non-equivalent 'realities'. Questions such as "Sustainability of what?", "…for whom?", "…for who long?", "… at what cost?" (Munda 2004; Walker, 2005) are answered differently depending on which perspective is given weight. Since there is no "single" perspective that can provide a universal answer to these questions the main epistemological characteristic of 'sustainability' is that it has to deal with the impossibility to be defined in absolute terms (Giampietro 2004).

4. CONCLUDING REMARKS

As stated in the introduction this paper addressed the following questions: i) how are the Tibetan rangelands governance institutions changing as a consequence of central government policies? ii) what are the main discourses and narratives behind the resettlement policies? iii) What socio-economic and metabolic differences between a traditional village and a resettlement can be highlighted? iv) is it possible to apply the evaluative criteria 'sustainability' to this complex issue? Through the application of a modified IAD, that integrated discourse and societal metabolism aspects, some answers were provided. Regarding the first research question, the Tibetan rangeland ecological governance systems in the Tibetan-Qinghai plateau went through numerous structural changes induced by the Chinese government policies since 1959. The institutional arrangements of the rangeland governance changed accordingly to the different policies implemented in five different periods since 1958. In particular the period 1999-2011 produced changes in the institutional arrangements that had a direct and immediate repercussion on the nomadic existence. Soon after 1999, the majority of Tibetan nomads, encouraged and supported by the Chinese Government fenced the owned land and built houses in the winter pastures. As a consequence of fencing horses become a less ideal system of transport because of the impossibility to move through valleys and were rapidly substituted by motorcycles as the main mean of transportation. This shows how the institutional arrangements are tightly connected with the metabolic transformations of a socio-ecological system. The main aspects of the transformation of institutional arrangements since 1958 can be summarized as:

1. The Chinese Government became the main legislative and political actor for the governance of the Tibetan-Qinghai rangelands socio-ecological system.
2. The decisions of the Chinese Government regarding the nomadic activity, land access, and environmental protection have been taken at the central national level and implemented in a uniform top-bottom way.
3. The differences between the different policies (for example different resettlement programs and interventions) are not related to a different application of programs to different ecological contexts but to political priorities changes at the central government level.
4. The traditional Tibetan institutional arrangements are still effective and work in as a nested

system where the villages are not resettled and have shared common land.

5. The institutional arrangements that govern the nomads-rangeland socio-ecological system have been disrupted through the resettlement policies.

Regarding the second research question, 'what are the main discourses and narratives behind the resettlement policies?, the poster discourse analysis revealed that while in 2007 the main narrative behind resettlement policies propaganda was related to environmental concern and ecological restoration programs in 2011 the focus shifted on education. The role of formal education in the tibetan nomads culture is beyond the scope of this paper but it appears as a crucial factor in the transformation of nomadic life style and the transmission of traditional ecological knowledge to the future generations.

The metabolic patterns and socio economic differences between resettlements and traditional villages, addressed in the third research question, have been previously described. It is important to highlight that moving from a traditional village to a resettlement affects all the main metabolic aspects of a nomadic household such as time, land, energy, materials, nutrition, water, human activity, mobility and information. For future research it would be interesting to scale up at a higher hierarchical level moving the level of analysis from the household level to the regional scale and in order to understand what are the outcomes of the resettlement policies on the overall rangeland system.

Regarding the last research question, 'is it possible to apply the evaluative criteria 'sustainability' to this complex issue?' It should be said that although the concept 'sustainability' has to deal with the impossibility to be defined in absolute terms there are some features that should be considered when comparing resettlements with traditional villages. The traditional nomadic institutions have been the result of a long process of adaptation to the ecological context while. The nomadic mode of existence and production is tightly linked with the biological system. The relationship between the Tibetan nomad, his livestock, the seasons, the pastures goes beyond the simple economic and productive activity, it enters the sphere of religion, beliefs and meaning of life. As in other nomadic contexts in Asia and Africa nomadism developed through a nested organization of different levels of rangeland governance (Mwangi and Ostrom 2009; Humphrey and Sneath 1999). In the Tibetan rangelands case the rules and norms that shape nomadic activity, land access, conflict resolution move across the family, groups, tribes and village levels. This implies that when there are ecological disturbances the Nomads respond and adapt with different and multi level solutions and the source of the problem is spatially and temporally closer to the people involved in the solution. It has been largely debated in the scientific literature that the top down mono-centric panaceas are counterproductive. In the specific resettlement policies context, the main features can be summarized as: a. the fact that the government becomes the main actor and that establishes objectives that are not endorsed by the local population; b. that the central government does not acknowledge the role of traditional institutional arrangements and consider them backward[8]; c. that there is no scientific evidence on the fact that the desired outcomes of the policies are beneficial for the ecosystem. Considering these three aspects it is clear that the central government institutional arrangements are delinked from the socio and ecological dimension that has evolved in an adaptive manner in the traditional nomadic institutions.

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[8] on the concept of 'backwardness' in relation to Chinese Governemnt view of Tibetans see Yeh XX, Fischer XX

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