



UNIVERSITAT
ROVIRA I VIRGILI
DEPARTAMENT D'ECONOMIA



WORKING PAPERS

Col·lecció “DOCUMENTS DE TREBALL DEL
DEPARTAMENT D'ECONOMIA - CREIP”

New stakeholders, spaces and instruments of analysis
in the context of energy relationships:
Case studies from Kazakhstan and Turkmenistan

Aurèlia Mañé, Victòria Soldevila, Carmen de la Cámara
i Albert Puig

Document de treball n.13 - 2012

DEPARTAMENT D'ECONOMIA – CREIP
Facultat d'Economia i Empresa



UNIVERSITAT
ROVIRA I VIRGILI
DEPARTAMENT D'ECONOMIA



Edita:

Departament d'Economia
www.fcee.urv.es/departaments/economia/public_html/index.html
Universitat Rovira i Virgili
Facultat d'Economia i Empresa
Avgda. de la Universitat, 1
43204 Reus
Tel.: +34 977 759 811
Fax: +34 977 300 661
Email: sde@urv.cat

CREIP
www.urv.cat/creip
Universitat Rovira i Virgili
Departament d'Economia
Avgda. de la Universitat, 1
43204 Reus
Tel.: +34 977 558 936
Email: creip@urv.cat

Adreçar comentaris al Departament d'Economia / CREIP

Dipòsit Legal: T - 848 - 2012

ISSN edició en paper: 1576 - 3382

ISSN edició electrònica: 1988 - 0820

DEPARTAMENT D'ECONOMIA – CREIP
Facultat d'Economia i Empresa

New stakeholders, spaces and instruments of analysis in the context of energy relationships: Case studies from Kazakhstan and Turkmenistan

Aurèlia Mañé Estrada (G.A.T.E. – Universitat de Barcelona)
Departament de Política Econòmica i Estructura Mundial
Universitat de Barcelona
E-mail: amimanera@ub.edu

Victòria Soldevila Lafon (Universitat Rovira i Virgili– CREIP-GRIT)
Departament d’Economia
Universitat Rovira i Virgili
E-mail mariavictoria.soldevila@urv.cat

Carmen de la Cámara Arilla (G.A.T.E. – Universitat de Barcelona)
Departament de Política Econòmica i Estructura Mundial
Universitat de Barcelona
E-mail: carmendelacamara@ub.edu

Albert Puig Gómez (G.A.T.E – Universitat Oberta de Catalunya)
Departament d’Economia i Empresa
Universitat Oberta de Catalunya
E-mail apuigo@uoc.edu

This paper is the result of research carried out within the framework of project RICIP2010 “La Cooperació a l’Àsia Central i les amenaces de la seguretat internacional derivades dels reptes ambientals i energètics”, led by Dr Mar Campins (University of Barcelona). The methodology used in the study of stakeholders forms part of a collaboration between this project and project CSO2011-29438-C05-02 “Nuevos espacios, actores e instrumentos en las relaciones exteriores de España con el Mundo Árabe y Musulmán”, led by Dr Miguel H. Larramendi (University of Castilla-La Mancha).

Abstract

The disintegration of the USSR brought the emergence of a new *geo-energy space* in Central Asia. This space arose in the context of a global energy transition, which began in the late 1970s. Therefore, this new space in a changing energy world requires both new conceptual frameworks of analysis and the creation of new analytical tools. Taking into account this fact, our paper attempts to apply the theoretical framework of the Global Commodity Chain (GCC) to the case of natural resources in Central Asia.

The aim of the paper is to check if there could be any Central Asia's geo-energy space, assuming that this space would exist if natural resources were managed with regional criteria.

The paper is divided into four sections. First an introduction that describes the new global energy context within natural resources of Central Asia would be integrated. Secondly, the paper justifies why the GCC methodology is suitable for the study of the value chains of energy products. Thirdly, we build up three cases studies (oil and uranium from Kazakhstan and gas from Turkmenistan) which reveal a high degree of uncertainty over the direction these chains will take. Finally, we present the conclusions of this study that state that the most plausible scenario would be the integration of energy resources of these countries in GCC where the core of the decision-making process will be far away from the region of Central Asia.

Key words: Energy transition, geo-energy space, Global Commodity Chains, Central Asia

New stakeholders, spaces and instruments of analysis in the context of energy relationships: Case studies from Kazakhstan and Turkmenistan

1. Introduction

Following the collapse of the Soviet Union the Central Asian region saw the emergence of an open and empty *geo-energy space*¹ (Mañé, 2011) comprising what are known as the five *stans*: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. In terms of the management of its energy resources this region must address a highly particular set of circumstances, which one could argue are unique in the history of international energy relations.

Firstly, there is the matter of creating a new, regional geo-energy space on the remaining foundations of the old Soviet space. The dissolution of the USSR led to a severing of the key segments of energy transmission lines in Kazakhstan, the enormous branches of the network that stretched throughout Central Asia, Transcaucasia and the European Soviet republics (Mañé & de la Cámara, 2010). This, as Smeenk (2010) puts it, was akin to amputating the Soviet *energy value chain* and, therefore, it raised the need either to rebuild regional energy chains or to connect to existing ones, such as the emerging Russian, Chinese or ‘traditional’ Western supply chains.

Secondly, this new, regional geo-energy space has to take shape within a region that has a skewed distribution of natural resources, a region which since the time of the Tsars had been centrally managed from the capital but which is now characterized by a series of cross-border and transnational relationships of dependency (Mañé & de la Cámara, 2010). A qualitative summary of these relationships is shown in **Table 1**.

¹ This is “a *geographical area with an energy governance structure. To be precise, a geographical space where a precise set of energy relationships take place among different agents — producer states, enterprises and consumer governments — who are active within it*” (Mañé, 2006). As Kérébel (2009) states, these spaces contain “the architecture of institutions and processes — formal and informal, public and private — which contribute to the definition of collective rules and the structuring of energy relations”.

As was demonstrated in a previous study (Mañé & de la Cámara, 2010) this severing of the energy network and the interdependencies shown in **Table 1** are driving most of the region towards *energy poverty*. In many debates the proposed solution to this situation, which also has serious environmental consequences, is that the water-rich countries (Kyrgyzstan and Tajikistan) exchange their water for energy from the countries with an abundant supply of fossil fuel and mineral resources (Kazakhstan, Turkmenistan and Uzbekistan). In a way, what lies behind such proposals is the idea, albeit an intuitive one, that the five *stans* can be regarded as a single unit in geo-energy terms, since their shared experience of disconnection from the old Soviet network gives them, in turn, a shared destiny: to replicate on a regional scale the centralized (Soviet) management of these resources so that they all have enough energy and water.

Table 1: Energy dependencies in Central Asia

Origin	Kazakhstan	Kyrgyzstan	Turkmenistan	Tajikistan	Uzbekistan
Kazakhstan		Coal Gas	Hydrocarbon transportation (HT) Oil		HT Oil
Kyrgyzstan	Water				
Turkmenistan	HT				HT
Tajikistan					Water
Uzbekistan	Gas Electricity	Coal Gas	HT	Gas	

Source: WEO, 2010

While it is true that this could be one way of managing, at least partially, the energy and environmental problems of the region the present paper starts from the premise that for this to occur it is necessary:

- a) for the region of the five *stans*, above and beyond its constituent countries, to be perceived as existing as such, and subsequently,
- b) that it is possible for regional stakeholders to manage with regional criteria the natural resources (energy, minerals and water) to be found on and below the surface of their territory.

Previous studies (Huici, 2010; Mañé, 2010) have raised the possibility that regional stakeholders do not regard their regional space as the territory delimited by the borders of the five *stans*. Moreover, it is noted in these studies, as well as in articles by correspondents of the *Central Asia Observatory*, that each of these countries differs in terms of what it understands to be its area of regional alliances. Given this, we believe it is unlikely that condition ‘a’ will be fulfilled, unless the Central Asian region is defined in a wider sense within a Euro-Asian space.

In the present paper, however, the focus is on the possibility of condition ‘b’ being fulfilled, this being considered through the analysis of three case studies: oil and uranium from Kazakhstan, and gas from Turkmenistan. To this end the paper follows a methodological approach suggested in previous studies (Mañé, 2011), namely to apply global commodity chain (GCC) or global value chain (GVC)² analysis to the energy relationships in the region. This is done with four aims:

- a) to determine whether there are regional value chains that are truly proper to the region, i.e. a geo-energy space which, as stated above, rebuilds the severed network on a regional scale,
- b) to identify the energy chains in which the energy resources of Central Asian territories are currently being concentrated, and therefore the power relationships that are in operation,
- c) to consider whether, in light of these power relationships, conflict or cooperation is the most likely outcome between the five countries of the region, and finally,
- d) to suggest which elements the regional energy governance structure should have.

To this end the rest of the paper is divided into four sections. The first sets out very briefly the current energy context in which the energy resources of Central Asia will have to be integrated, a context that is characterized by large transnational (global) energy chains involving new kinds of energy stakeholders alongside the ‘traditional’ international oil companies (IOCs) and national oil companies (NOCs)³. The next, conceptual and methodological section explains why, given the current situation, it is

² For a definition of these terms, see section 3.

³ See Table 3 in sub-section 3.3

appropriate to apply analyses based on GCCs to the question of energy relations. The following section, which is more empirical, analyses the cases of oil and uranium in Kazakhstan and of gas in Turkmenistan (these being resources which are integrated within GCCs), the aim being to determine whether there are regional energy chains and to identify the power relationships that might exist within them. These cases were chosen due to the importance of the two countries as producers: Kazakhstan is the principal producer of oil and uranium in Central Asia, while Turkmenistan is the main gas producer. The final section presents the conclusions to be drawn from the study.

2. The global energy context within which the resources of Central Asia will be integrated

As is the case for all post-Soviet territory the Central Asian energy space is emerging in a very different context to that which would correspond to a *dichotomous energy paradigm* (DEP). According to this paradigm, energy relations are conflictive and antagonistic and developed between two kinds of countries: *consumers* and *producers*. In previous studies it has been explained why it makes little sense to analyse the role of natural resources in Central Asia within a DEP framework, i.e. it is not helpful to conceptualize, for example, Kazakhstan as if it were a *producer country* (Mañé, 2011).

Briefly, and as shown in **Table 2**, this is because the energy model changes as there ceases to be a functional relationship between the economic structure and the existing energy model. Although detailed examination of this point goes beyond the scope of this paper, one might say that the crisis appears when the energy model no longer adapts to the existing paradigm (in the Kuhnian sense) (Sheer, 2009; Mañé, 2011b)

As can be seen in **Table 2** there have been different stages (energy periods) which are characterized not only by the use of different combinations of energy sources but also by the whole economic, geographical, political and social organization that was an inherent part of each energy model.

Table 2: Function, within capitalism, of countries rich in energy resources⁴

	Colonialism (end of eighteenth century-1940)	Bipolar world (1945- 1989)	Global world (1990-the present day)
Dominant energy	Coal	Hydrocarbons	Energy mix
Hegemonic economy	United Kingdom	United States	Under construction
Stage of capitalism	Concurrential to monopoly capitalism	Fordism	Finance capitalism
Function of territories rich in natural resources	Supply basic assets or being an enclave	Supply 'cheap' primary energy for the industrialization of the OECD	Supply 'affordable' global energy and finance debtor countries of the OECD through petro- dollars or sovereign funds
Institutions 'with power' within the international energy industry	'Seven Sisters'	OPEC and OECD (IEA)	Large IOCs and the new super NOCs of <i>emerging countries and energies</i> and financial funds

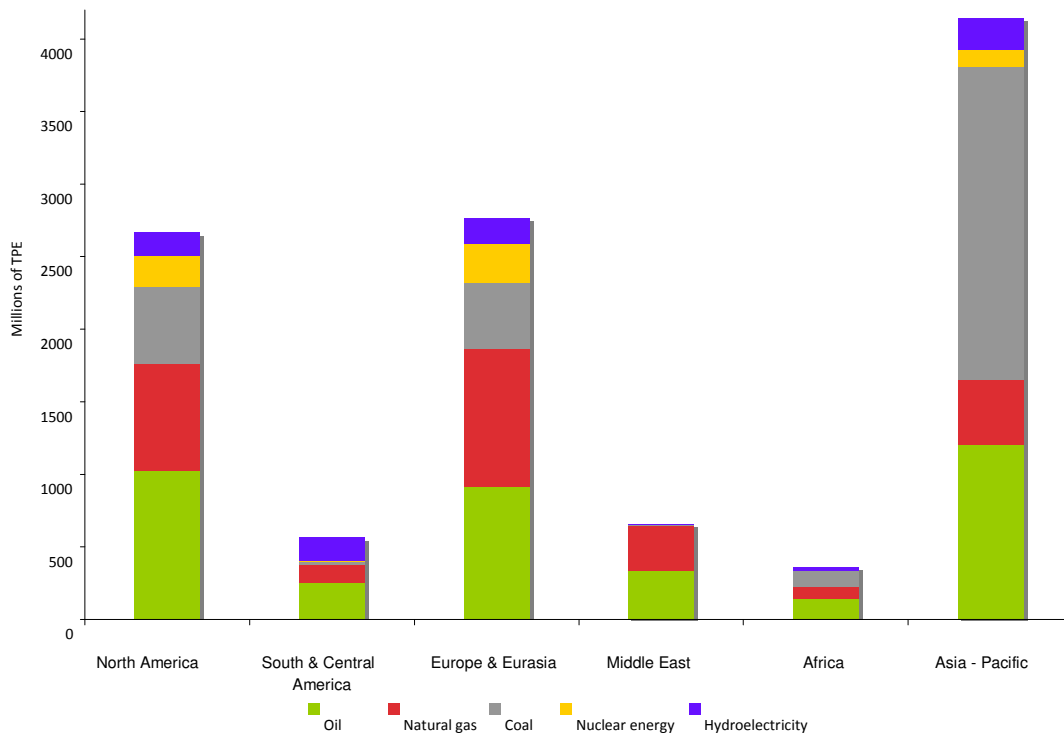
Source: present authors

Since the invention of the steam engine towards the end of the eighteenth century there have been two hegemonic models of capitalism, and we are now in transition towards a third. The first model, corresponding to the concurrential stage, was based on coal and made possible the First Industrial Revolution (Martínez & Vidal Villa, 2001). The second model was based on oil and corresponds to the monopoly stage, during the first phase of which the privately-owned oil companies, often referred to as the *Seven Sisters*, took control of energy resources and the whole of the energy/oil chain. With the Second World War a new stage emerged in which, from the 1970s onwards, the oil industry, having been one of the pillars of Fordist development ('Bipolar world' in Table 2), became subordinated to a strategy of the global energy industry, in which new and old sources of energy co-exist. Thus began the construction ('Global world' in Table 2) of a third and more varied energy model.

⁴ Although this aspect is referred to in the table a more detailed examination is left for future analyses that will be conducted as part of project RICIP2010.

For the purposes of this paper it will be useful to highlight certain aspects of the current stage of energy relations, not least that it constitutes an *energy transition*⁵ which is characterized by a progressive loss of emphasis on oil as the primary source of the hegemonic *energy model*⁶. As can be deduced from the data presented in **Figure 1** this transition is being driven by two factors.

Figure 1: Consumption according to type of primary energy source, 2009



Source: BP, *Statistical Review of World Energy 2010*

The first factor is that at the combined and global level, the Asia-Pacific region is the world’s principal energy consumer. If one adds to this block the part corresponding to

⁵ This concept is defined as the process through which dominant energy sources and their related activities enter into a state of crisis and are replaced by others. We are currently in a long period of energy transition that began in the so-called Western world in the 1980s, when, according to Martin Melosi in his essay *Energy Transitions in Historical Perspective* (2006), what occurred was not so much a shock regarding supply in the long term, but rather a blow to a deep-rooted view of the world: the American way of life.

⁶ An energy model is the energy basis of the system and is defined as the specific set of primary, secondary and final energy sources and the associated activities of concentration, conservation and diffusion that are used by a given society during a given historical period. More broadly, an energy model includes the whole of an energy chain and implicitly implies a scientific and technical model, an economic structure, a form of political and social organization and a set of values.

Eurasia from the third bar in the figure, then it can be unequivocally stated that the 'international energy world' has shifted from West to East. It is therefore logical to think in terms of a shift in the axis of energy relations towards the East.

The second factor relates to the consequences of this shift, namely the growing presence of energy sources other than oil, which has even led some authors, such as Martin-Amouroux (2008), to state that we have entered the twenty-first century with a nineteenth-century fuel: coal. As he points out, it is striking that the great loser in the energy history of the twentieth century (i.e. coal) has become one of today's main protagonists. In light of the crisis produced by the accident at the Fukushima nuclear plant, Martin-Amouroux may well be right⁷, although here we will limit ourselves to stating that there is an increasing diversification of primary energy sources within the global energy mix.

In terms of energy production and export the consequences of the above are a substantial shift in the function of the type of territories which are rich in natural resources (penultimate row in **Table 2**), and the possibility that States or national companies become stakeholders on the international energy stage. Until very recently the members of the Organization of Petroleum Exporting Countries (OPEC) were understood to be international energy stakeholders, but one did not think in terms of countries or territories — even were they to exist — that exported coal, uranium or electricity produced by solar, wind or water technology, countries which might therefore seek to establish international relations.

⁷ The principal energy initiatives adopted by some of the world's main energy consumers, such as the USA, the United Kingdom or Germany, following Fukushima have sought to promote clean coal technology. In the USA, President Obama followed up the 2009 launch of the third round of the Clean Coal Energy Initiative (<http://www.fossil.energy.gov/programs/powersystems/cleancoal/>) with a State of the Union address in 2011 that reiterated his commitment to this technology, going as far as to state: "We will enter into public-private partnerships to develop five 'first-of-a-kind' commercial scale coal-fired plants with clean carbon capture and sequestration technology". In the United Kingdom, each of the government's energy policies, such as the Plan UK 2050 or Zero Carbon Britain 2030, target an increased use of clean coal technology and state the wish to make the UK a leader in this type of technology. In the case of Germany, Chancellor Merkel's proposal to shut down the country's nuclear plants has been accompanied by an increase in coal mining. Furthermore, the International Energy Agency (IEA), which has acted as a cartel of oil-consuming countries from the OECD, has significantly set up its own Clean Coal Centre (http://www.iea.org/techno/iaresults.asp?id_ia=25).

The corollary is that associated with this, another type of international energy company has appeared (final row of **Table 2**), companies which may become key stakeholders on the international energy stage. Some of these are new kinds of national oil company, often now referred to as the *new NOCs*, a good example of which is the Russian Gazprom. However, other companies (both state-run and private) with a transnational vocation are making a strong entry into the market, related, for instance, to the increasing industrial restructuring of coal mining on a global scale (Martin-Amouroux, 2008), while among the case studies presented here an example would be the Kazakh uranium mining company KazAtomProm.

The other side of the coin is a shift in the international context of demand and consumption. This is no longer limited to what were traditionally known as the *consumer countries*, principally those of the Organization for Economic Cooperation and Development (OECD), with their governments and ‘their’ transnational energy companies (final row in **Table 2**) clustered around the International Energy Agency (IEA). These were the so-called international oil companies (IOCs), i.e. companies such as ExxonMobil, Texaco, Royal Dutch Shell, British Petroleum, TotalFinaElf or, in the case of Spain, Repsol YPF. Nowadays, however, and especially in emerging economies, there are companies that, acting from the perspective of demand and consumption, have a different profile to that of the IOCs. Primary examples of these ‘new’ companies are the consumer NOCs from emerging consumer countries (CNPC, Sinopec and CNOOC in China, and ONGC in India).

The emergence of new stakeholders, both in terms of production/export and demand/consumption, has gone hand in hand with the growing transnationalization of the global energy stage, a process which, in the case of oil, was considerably reinforced during the 1990s (Mañé, 2005; Noël, 1999; Kérébel, 2009). Therefore, rather than speaking about *producer countries* or *consumer countries* it is now more appropriate to think in terms of integrated international or transnational energy chains (World Bank, 2009), comprising all manner of NOCs and IOCs that integrate either in the downstream (a producer/export company that enters the demand/consumption field) or the upstream (the reverse). The consequence of this has been an “increase in the number of stakeholders involved in energy markets, which in turn has led to increased

power struggles. The rules of the energy game have changed completely in a matter of years” (Kérébel, 2009: 17)

From this perspective, if one includes a geographical component then the producer territories, in geo-energy⁸ terms, are becoming integrated within larger energy spaces that do not always coincide with their immediate physical borders.

In summary, the emergence of the post-Soviet space, the changes in the energy needs of the system, the emergence of new energy stakeholders and the rise of large global energy chains implies a colossal shift in terms of existing stakeholders, geography and international energy relations. Within this framework the role of Central Asia as an energy stakeholder will result from the contradiction that arises between the need to resolve regional complementarities (reflected in **Table 1**) and the role of the region’s natural resources within the large global energy chains that ‘serve’ the interests of the global and emerging energy world. How this duality is managed, regionally, will depend on the governance structures that are created in the geo-energy space (or spaces) of Central Asia.

3. The methodological framework for analysing energy chains in Central Asia: Global value chains

The changes taking place on the global energy stage force us to rethink and develop new frameworks of analysis. In our opinion, a suitable theoretical approach to the topic of this paper is provided by the concept of *global commodity chain* (GCC) or *global value chain* (GVC)⁹.

3.1. The methodological framework of global commodity chains

Research into GCCs has its origins in the concept of *commodity chain*, which was defined by Hopkins and Wallerstein in 1986 as:

⁸ See note 2

⁹ Kaplinsky and Morris replace the concept of global commodity chain, coined by Gereffi, with the notion of *global value chain*; the latter is better suited to a multi-faceted framework of analysis and is used for all kinds of products, including non-commodities, with a high degree of product differentiation and high entry barriers (Kaplinsky & Morris, 2002). This new terminology was widely adopted in the field of GCC research and both terms are now used without distinction, although some authors, such as Bair, consider that there are slight differences between the two (Bair, 2005).

“a network of labor and production processes whose end result is a finished commodity” (Hopkins & Wallerstein, 1986: 159).

The analytic capacity of the concept of commodity chain derives from its emphasis on process and its close links to world systems theory, as set out by Wallerstein in 1974. This enables the role of commodity chains to be observed within a broader framework, namely that of the process through which capital is accumulated within the capitalist system, as well as observing how the surplus produced by the chain as a whole is distributed unequally among the different links of which it is comprised.

At all events, the key point in the development of GCC research was the publication in 1994 of the book *Commodity Chains and Global Capitalism*, edited by Gary Gereffi and Miguel Korzeniewicz, in which the main concepts and lines of analysis related to GCCs are set out. As stated by Gereffi, the GCC approach reformulates conceptual categories in order to analyse patterns of change and global organization. Gereffi and Korzeniewicz define the global commodity chain as follows:

“A GCC consists of sets of interorganizational networks clustered around one commodity or product, linking households, enterprises, and states to another within the world-economy. These networks are situationally specific, socially constructed, and locally integrated, underscoring the social embeddedness of economic organization” (Gereffi & Korzeniewicz, 1994: 2).

Gereffi goes on to state that:

“commodity chains have three main dimensions: an input-output structure (a set of products and services linked together in a sequence of value-adding economic activities); a territoriality (spatial dispersion or concentration of enterprises in production and distribution networks); and a governance structure (authority and power relationships)” (Gereffi & Korzeniewicz, 1994: 97).

By integrating these three dimensions within a single concept the GCC can incorporate elements of traditional value-chain studies¹⁰ (the input-output flow) and of research into *filières* (chains) and sectorial complexes¹¹ (the analysis of power relationships or governance), at the same time as being able to analyse phenomena such as internationalization and the impact that different links in the chain have on the territory in which they are located (since the concept also takes territoriality into account).

The concept of *governance* is one of the most significant contributions of GCC research. Gereffi makes the distinction between *producer-driven* and *buyer-driven* commodity chains. In a producer-driven chain the high barriers to entry (resulting from economies of scale, the intensive use of technology and high investment costs) make it easier for producers to control the chain. By contrast, a buyer-driven chain presents few barriers to entering the productive sector, and therefore a greater role is played by aspects such as commercialization, design and innovation in relation to the final product. According to Gereffi, one of the greatest transformations in recent years has been the shift from producer-driven to buyer-driven commodity chains in important manufacturing sectors.

At a more micro level (companies) the notion of governance refers to who decides what is produced, and how, within the GCC (Kaplinsky & Morris, 2002). Thus, governance implies the ability of 'lead firms' to assign activities of less added value to the other stakeholders in the chain, and/or to exclude them from the chain (Raikes, Jensen & Ponte, 2000). Kaplinsky and Morris also note that the lead firm is able to ignore the demands of other links in the chain (Kaplinsky & Morris, 2002). This notion of 'lead firm' is a dynamic concept, and changes in terms of who the lead firms are will give rise to a restructuring of the chain, which will, in turn, have important

¹⁰ By 'traditional' value-chain studies we are referring to those which are basically limited to describing the different productive stages involved in the manufacture of a given product, in line with that set out by Porter (Porter, 1985).

¹¹ The analysis of *filières* (chains) has been widely applied in studies of agro-food products, especially in France (Malassis, 1977). In addition to describing the productive stages of an agro-food product these studies analyse the power relationships that are established between the different stakeholders involved in the *filière*. The aim was to show how the agricultural producer is usually in a relationship of dependency with respect to the industrial sectors of the *filière* (the input supply industry, the transforming industry).

consequences not only for the functioning of the chain and its stakeholders, but also for the territories in which the chain is located.

The methodological approach developed by Gereffi and Korzeniewicz has evolved over the last twenty years, with new contributions and new concepts being constantly added to the analysis of GCCs/GVCs (see Gereffi (1996); Kaplinsky & Morris (2002); Gibbon, Bair & Ponte (2008); Bair (2005); Gereffi, Humphrey & Sturgeon (2005); Schmitz (2005)). The outcome of all this is a more 'compact' theoretical framework, one that is better structured and more systematic.

Research on GCCs and GVCs has also given rise to a rather similar set of new concepts. Noteworthy among these is the notion of *global production network* (GPN) (Coe et al., 2008), which emphasizes the concept of 'network' in order to understand the relationships between different stakeholders, going beyond the more linear view of GCC/GVC analyses. The GPN approach also seeks to incorporate new stakeholders: the State, civil organizations, consumers and workers (Coe et al., 2008). Nonetheless, the concept of GPNs does not differ greatly from that of GCC/GVC research, and studies based on the GPN approach are still relatively few in number.

At all events, studies based on the concepts of GCCs, GVCs and GPNs have been particularly well regarded in recent years, especially when it comes to analysing the value chain of manufactured products (see, among others, Gereffi (1994, 1999, 2003, 2006); Barnes & Kaplinsky (2000); Schmitz (2006); Sturgeon (2011, 2009); and Lema (2010)). Furthermore, the versatility of this approach has enabled it to be successfully adapted to other spheres, such as agricultural products (see Ponte (2002); Pelupessy & van Kempen (2005); Gwynne (2006); Humphrey & Memedovic (2006); Kaplinsky (2006); Vagneron et al. (2009); Soldevila, Viladomiu & Francés (2009); Patel-Campillo, A. (2010)) or the service sector (Clancy (1998); Sokol (2007)).

However, whereas traditional value-chain studies have commonly been conducted to analyse energy products (World Bank, 2009; Smeenk, 2010), the GCC/GVC/GPN approach has rarely been applied in this context. Noting this circumstance, Ciccantell and Smith (2009) argue that GCC studies tend to focus on the final stages of the value chain and ignore the processes of extracting and transporting raw materials.

Therefore, it is necessary to 'lengthen' the value chains and give due weight to the analysis of primary resources.

“Thus, starting at the beginning of commodity chains not only provides a more comprehensive and complete story of contested transformations sequences, but it also reveals new ways in which geographic and spatial disarticulations and ecological inequalities are integral to the global economy” (Ciccantell & Smith, 2009: 363).

In our opinion, the minimal attention paid to GCC analysis as a way of studying energy products is also due to certain methodological difficulties. As will be pointed out below, certain concepts within the GCC approach need to be redefined if they are to be suitable for the study of energy products. Nevertheless, and as is set out in the next section, we believe that the analytic framework provided by the GCC approach is well suited to the topic of the present study.

3.2. Justification and suitability of the GCC/GVC approach in relation to the study topic

Traditionally, studies of energy products were based either on an analysis at the level of the nation state (in which case a distinction was made between producer and consumer countries, as in the dichotomous energy paradigm), or on an analysis of stakeholders (mainly transnational energy companies). GCC/GVC analyses, however, can go beyond this partial view, since one of their main advantages is precisely their integrative nature, which enables them not only to overcome the limitations of other analytic frameworks that focus on the nation-state level, but also to integrate different theoretical developments that include macro, meso and micro-economic aspects:

“the analysis of GCCs provides a bridge between the macro-historical concerns that have usually characterized the world-systems literature, and the micro-organizational and state-centered issues that have stimulated recent studies in international political economy” (Gereffi & Korzeniewicz, 1994: 9).

Indeed, the combination of these three levels of analysis (the macro, linked to world-systems research; the meso, linked to studies of value chains; and the micro, addressing the functioning of stakeholders in the chain) in a single methodological

instrument helps to avoid partiality and enables the present study to achieve greater analytic richness.

Moreover, the three dimensions of the GCC (input-output flow, territoriality, governance) are readily adaptable to the concept of geo-energy space, as defined above: the input-output flow is represented by the integrated energy chain; territoriality corresponds to the chain's geographical space; and governance is represented by the institutional structure of power relationships that exist between different stakeholders in the chain.

The first dimension, the input-output flow, enables us to describe the chains that develop around energy products and observe the similarities and differences between them. Thus, in the value chains involving energy products it is possible to distinguish between three productive stages: *upstream*, *midstream* and *downstream*. The upstream includes activities of exploitation, development and production of the primary energy source (in the case of oil, for example, this would include the search for oilfields, initial explorations, engineering projects, etc., and especially the extraction of crude oil). The midstream refers to all infrastructure related to the transportation and storage of the resource until it reaches the processing facilities. Finally, the downstream covers those activities required to transform the oil, gas or uranium into the final energy product, as well as the activities linked to its commercialization.

As will be seen in the case studies below, the different companies may cover one or more of these production stages in the chain.

The second dimension of GCC analyses is territoriality. This is an aspect that cannot be overlooked in the study of energy products, since energy resources (oilfields, mines, etc.) are specific factors that cannot be delocalized. In other words, they are tied to a particular geographical location and, as Bunker and Ciccantell (2007) point out, the local (geological features, the indigenous population, conflicts over access to resources, etc.) will determine the global (the strategies of companies and nation states) in the GCC of basic products; we would add, however, that the global will also determine the local. At all events, the GCC methodology is able to address these issues and locate the territorial aspects of global productive processes at the heart of the analysis (Ciccantell & Smith, 2009).

The final key dimension of GCCs is governance. The value chains of energy products are becoming increasingly complex and include a greater number of links (or productive stages), with the companies involved also having different interests. Furthermore, the relationships between the different stakeholders in the value chain of energy products are not symmetrical, and not all stakeholders are able to exert the same influence over the chain as a whole. By using the concept of governance it is possible to observe how economic activity within the chain is coordinated and to identify which links (upstream, midstream and downstream) and which stakeholders (lead firms) have the greatest capacity to control the chain. A large part of the contribution to a territory's development and of the interrelations between different territories depends on how energy value chains are structured and on the 'power' of the stakeholders located in different countries. In this regard, the concept of governance is crucial for the present analysis.

In sum, the integrative nature of the GCC approach, the incorporation of territoriality and the emphasis on power relations make the GCC methodology well suited to addressing the questions that were posed in the introduction to this paper. However, and as pointed out in the previous sub-section, certain concepts within the GCC approach need to be redefined if they are to be suitable for the study of energy products. In particular, the governance dimension has a number of defining features that need to be incorporated. The next section addresses this.

3.3. *Adapting the GCC approach to the energy context*

Having justified the suitability of applying GCC analysis to the question of energy resources the next step is to set out how this methodology will be adapted to this context. The starting point for this adaptation is that in the context of international energy chains, companies (i.e. the micro-level stakeholders defined in the GCC) may be of two types: private (IOCs) or national (NOCs). As the motivation of these two types of company will not be the same there is a significant difference with respect to non-energy GCCs, where companies seek to achieve governance of the chain with a single objective: attaining as much as possible of the economic surplus generated by the chain. In the energy context, however, while the main objective of IOCs is to obtain the maximum possible profit (as much surplus as possible) from the value chain, the

priority objective of NOCs will be defined in terms of the country's 'general interests'. There is also the case which we define as hybrid (see **Table 3**), which is usually a private company that the government uses as if it were an NOC.

More specifically, we believe that the potential motivations of companies involved in energy GCCs are follows¹²:

- 1) to attain as much as possible of the surplus, which may be turned into national income or profit;
- 2) to ensure a safe and constant supply of energy for 'their' economy; and
- 3) to achieve greater influence as a stakeholder on the international stage.

Methodologically, the analysis of these two questions (i.e. that there are two types of stakeholder and that these may have up to three objectives, ranging from the micro level (more profit for the company) to the global level (being an important or hegemonic regional or global stakeholder)) is favoured within the GCC framework, since the latter integrates both micro/meso and macroeconomic aspects.

As a result of the particular characteristics described above it is necessary to redefine the *producer-driven* and *buyer-driven* categories of the energy GCC, although the need for such a redefinition in no way invalidates the use of the rest of the conceptual framework implicit within these categories. In particular, the concept of *lead firm* will be highly useful for our analysis of regional power. Indeed, in the case that concerns us here we consider that the type of governance which prevails in the chain (i.e. producer or buyer driven) depends, principally, on the type of company that establishes itself as the lead firm. For energy products the lead firm determines not only 'what' is produced, and 'how', as in Kaplinsky and Morris's definition of GCC governance, but also 'for whom' and 'for where' the final product is destined.

¹² In fact the present study is also premised on a fourth motivation, since by proposing the analysis in terms of whether or not the States in the region will be able to manage their natural resources according to regional criteria, and by including within these criteria the possibility that energy may be exchanged for water resources, it is assumed that one of the objectives of NOCs in Central Asia, as instruments of public intervention, is to exploit their natural resources with a view to the possibility of such an exchange.

These considerations are reflected in the classification of companies shown in **Table 3**. The categorization is based on the case of hydrocarbons (oil and gas) and will then be adapted, as far as possible, to the case of uranium, as these are the three sectors addressed by the case studies analysed in section four.

Table 3: Categorization of energy companies (oil and gas)

NOCs	State-owned national oil or gas companies
<p style="text-align: center;"><u>'Old' NOCs</u></p> <p>If the lead firm is an 'old' NOC the value chain is usually characterized by producer-driven behaviour.</p>	<p>These are upstream companies, some of which will also engage in midstream activity, that serve as an instrument of national, public intervention, their main objective being to generate as much <u>national income</u> as possible for the <i>producer country</i>. Secondary objectives include helping to ensure a stable supply of energy and being a relevant stakeholder on the international stage.</p>
<p style="text-align: center;"><u>'New' NOCs</u></p> <p>If the lead firm is a 'new' NOC the value chain may be characterized by producer-driven or buyer-driven behaviour.</p>	<p>These are integrated companies with a broad scope (they act upstream, midstream and downstream) and are commonly found in what are known as <i>emerging economies</i>. They serve as an instrument of national, public intervention. The objective of 'new' NOCs is not always the same and, depending on the nature of national requirements, it is not always clear which is the primary objective. In general, some of these companies will have an objective similar to that of 'old' NOCs (<u>national income</u>), while the objective of others will be to ensure the <u>final supply</u> of energy to the country. In both these cases what 'new' NOCs have in common is that they are used as instruments to gain <u>power on the regional or international stage</u>.</p>
IOCs	Integrated, private and transnational energy companies
<p style="text-align: center;"><u>'Western' IOCs</u></p> <p>If the lead firm is a 'Western' IOC the value chain is generally characterized by buyer-driven behaviour, although depending on the company's profit maximizing strategies</p>	<p>These are the large, integrated, private and transnational energy companies that have been established in the Western countries of the OECD and which are clustered around the IEA. The majority of the most important ones are direct descendants of the 'Seven Sisters'. These companies are associated with what are known as <i>consumer countries</i>, although their objective is that of private firms, i.e. to maximize profits in the value chain as a whole. Depending on the circumstances they may act more as extractors/producers or as demand/consumer companies. In both cases their objective is to obtain <u>as much profit</u> as possible.</p>

it may be producer driven.	
<p style="text-align: center;"><u>'Hybrid' IOCs</u></p> <p>With the exception of Russian companies, if the lead firm is a 'hybrid' IOC the value chain is generally characterized by buyer-driven behaviour.</p>	<p>These are integrated energy companies, generally in the East or in emerging economies, that are privately owned but which directly serve the interests of the government of their respective country. In this regard, and <u>as in the case of 'new' NOCs</u>, their objectives will depend on national priorities. However, <u>unlike</u> the 'new' NOCs hybrid companies are not usually strong enough to become significant <u>regional or international stakeholders</u>.</p>

Source: present authors

For the case study analysis we start by assuming that the degree of power a company has in the context of international energy relations does not depend on whether it is an NOC or an IOC, but rather on how integrated it is (the more stages it is involved in the more influence it will have), on the number of territories in which it is present and on the amount of product (primary, secondary or final energy) it controls.

Thus, it is assumed that when a company forms part of a value chain it is more likely to become the lead firm if: a) it is an integrated company (i.e. its acts upstream, midstream and downstream); b) it operates in different countries (i.e. it is transnational, and therefore its raw material sites and/or markets are located in different places around the world); and c) it is among the world's top-ranked companies in one or more of the three stages. Conversely, a company is unlikely to be the lead firm in the GCC if: a) it is only present in one of the three stages; b) its sphere of activity is national; and c) it is not among the top-ranked companies for any of the three stages.

Thus, in general terms, the four kinds of stakeholders defined above can be classified, as shown in **Table 4**, according to the amount of power they would have within regional or global energy chains.

Table 4: Possibility of being the lead firm among energy companies, according to category

	Integrated	Transnational	Top-ranked	Power in regional/global chain	Possibility of being the lead firm
'Old' NOCs	No	No	Yes (upstream)	Medium to low	Weak
'New' NOCs	Yes	Yes	Yes (up-, mid- or downstream)	High	Strong
'Western' IOCs	Yes	Yes	Yes (mid- or downstream)	High	Strong
'Hybrid' IOCs	Yes	No	No	Low to medium	Very weak

Source: present authors

3.4. Adapting the GCC approach to the specific case addressed by this study

In the analysis of the three case studies (oil, gas and uranium) it is assumed, setting aside any constraints imposed through government or international regulations, that in energy GCCs the 'new' NOCs and the 'Western' IOCs have, *a priori*, more power than, in this order, the 'old' NOCs and the 'hybrid' IOCs. Given that our case studies are centred on the territory of Central Asia the only possible scenarios are those set out in **Table 5**. For the analysis of hydrocarbons the scenario involves an 'old' NOC becoming integrated in chains formed by one or more of the other types of company, while for the analysis of uranium the possibility considered is of a 'new' NOC becoming integrated in other chains. Under current circumstances the other combinations seem highly unlikely¹³.

¹³ See appendices 1 to 6.

Table 5: Who can be the lead firm in a value chain?

If an 'old' or 'new' NOC becomes integrated in a chain with:	'Old' NOC	'New' NOC	'Western' IOC	'Hybrid' IOC
'Old' NOC	C1: Increased possibility of being the lead firm	C2: Lead firm is the 'new' NOC	C3: Lead firm is the 'Western' IOC	C4: Outcome unclear
'New' NOC		C5: Outcome unclear. Different objectives?	C6: Outcome unclear. Different objectives?	C7: Lead firm is the 'new' NOC

Source: present authors

Thus, although the degree may vary:

- In scenario C1 there may be a tendency to form alliances of producers, with the aim of influencing the chain.
- In scenarios C2 and C3 the nature of the chain (producer or buyer driven) and the objectives of the companies of which it is comprised will be determined by the priority objective of the lead firm. Scenario C7 could end up being assimilated to one of these two.
- In scenario C4 neither of the two stakeholders would be able to impose its strategy and, therefore, it is difficult to establish the outcome, unless we incorporate into the analysis other factors such as the weight of the respective countries within international agreements. However, it is highly likely that what emerges will be a certain complementarity of objectives (a producer forming an alliance with a final consumer).
- In scenarios C5 and C6 different types of alliance may emerge, as in the game of possible objectives it seems likely that these kinds of companies will only

become integrated within the same chain when it is mutually beneficial for them to do so (for example, when one company's objective of gaining influence or ensuring the energy supply is compatible with the other's objective of maximizing profits).

Having established these kinds of power relations, incorporation of the geographical component into the analysis means that the following hypotheses can be proposed:

a) In the event of scenario C1 there could be a regional alliance of producers that — relatively strong but in a position of inferiority — become integrated within a Euro-Asian or global governance structure whose centre is far from the region (such a scenario would resemble the OPEC/IEA situation). This alliance of producers would not be the lead firm, but it would have a certain negotiating capacity (scenario C7 would once again be the reverse).

b) In scenarios C2 and C3 the governance structure and relations are asymmetrical. The natural resources or stakeholders from the territory of the 'old' NOC become integrated in a 'position of inferiority' and, therefore, have limited decision-making capacity within the institutional structure that develops in their geo-energy space. To put it another way, the centre of the geo-energy space will move away from where the natural resources are located. In this case the negotiating capacity of the 'old' NOC is extremely limited and it is therefore difficult for it to impose its objectives.

c) In scenarios C4, C5 and C6, relationships within the governance structure are more symmetrical. The conditions under which the stakeholders become integrated within the GCC are more equitable and, therefore, their capacity to influence the institutional structure of the geo-energy space will be more similar. Thus, one can expect relations to be more cooperative, or extremely conflictive. In this case the centre of the geo-energy space will be more diffuse and widely spread.

4. Case studies

The three case studies to which GCC analysis will be applied are as follows: oil from Kazakhstan, gas from Turkmenistan and an outline of the case of uranium from Kazakhstan. In each case an attempt is made to analyse how the country's energy

and/or mining companies and its natural resources are integrated within more extensive value chains. The analysis seeks to answer two of the questions that were posed at the beginning of this paper, namely, to determine whether there are regional value chains that are truly proper to the region, and to identify the power relationships that are present within the energy chains in which the energy resources of Central Asian territories are currently being integrated.

To this end it is necessary to state that we are assuming the following:

- a) if the stakeholder that becomes integrated within the GCC is not a lead firm then it will have limited capacity to impose its own strategy; and
- b) if the stakeholders of the region (i.e. the territory of the five *stans*) that become integrated within the GCC are not lead firms then it is unlikely that any resulting chain will have a regional centre.

Here we will base our approach on the most simplified version of the integrated energy chain, one involving three elements: upstream, midstream and downstream. In this case the analysis focuses on the companies that are involved in the upstream and midstream of Kazakhstan and Turkmenistan.

4.1. The chain for oil from Kazakhstan

Table 6 shows the relative influence of the different stakeholders that operate in the upstream (extraction of oil from Kazakh oilfields) and the midstream (transportation of this crude oil to other countries). The analysis is limited as it is static, providing only a short-term snapshot.

Table 6: Principal upstream and midstream stakeholders for oil from Kazakhstan

	Upstream		Midstream	
Stakeholders	Predicated production 2013	%	Total transportation 2013	%
NOCs	KazMunaiGaz (KZ)	25.14	KazMunaiGaz (KZ)	11.08
Total 'old' NOCs Central Asia		25.14	Total 'old' NOCs	11.08
IOCs	Chevron (USA)	20.75	Chevron (USA)	8.74
	ExxonMobil (USA)	12.98		
	ConocoPhillips (USA)	2.07		
IOCs	BG Group (UK)	5.01		
	ENI-AGIP (IT)	9.15		
	Shell (NL-UK)	4.14		
	Total (FR)	4.14		
Total integrated 'Western' IOCs		58.24	Total integrated 'Western' IOCs	8.74
Hybrid	Lukoil and LukARCO	4.08	LukARCO (Russia)	7.29
Hybrid	Inpex	1.87		
Total 'hybrids'		5.95	Total 'hybrids'	7.29
NOCs			Transneft (Russia)	63.92
Total 'new' producer NOCs			Total 'new' producer NOCs	63.92
NOCs	CNPC	10.67	CNODC (China)	8.97
Total 'new' consumer NOCs		10.67	Total 'new' consumer NOCs	8.97
Total Euro-Asian (without KZ)		16.62	Total Euro-Asian (without KZ)	80.18

Source: WEO 2010, EIA *Country analysis, Kazakhstan* and own elaboration

The oil stakeholders in Kazakhstan correspond to the four types described in **Table 3**:

- 1) The national oil company of Kazakhstan is KazMunaiGaz, a state-run company involved in the extraction and export of oil; its behaviour is therefore equivalent to that of the 'old' NOCs. The company is one of the Kazakh government's main instruments of public intervention and its basic function is to be a key instrument for generating national income. Therefore, we assume that it fulfils the conditions described in **Table 3** for this type of company. In our most recent calculations (Mañé, 2011), KazMunaiGaz came 63rd (near the bottom) in the world ranking of oil and gas companies.
- 2) A consortium of large, 'Western' IOCs, almost all of which are ranked within the world's top ten according to our calculations (Mañé, 2011).

3) Two types of 'new' NOC, which according to our calculations are between 10 and 20 in the world ranking:

- The Russian companies have a more producer-driven behaviour, with two objectives: to obtain maximum income from the sale of oil on the international market, and to use their role of 'exporter' to continue being a significant stakeholder on the Euro-Asian stage.
- The Chinese companies have a more buyer-driven behaviour, also with two objectives: to ensure the supply of energy required for the growth and development of their (enormously voracious) economy and, as a result of the autonomy (from the hegemonic Western energy model) that this supply would give them, to become a world power.

4) A few 'hybrid' IOCs, all of which are Euro-Asian.

In line with the explanations given in the previous section the combined presence of these four types of company in the extraction, export and transportation of Kazakh oil suggests that the lead firms in this context are most likely to be of types 2) and 3) above. Therefore, the final behaviour (producer or buyer driven) of the value chain in which KazMunaiGaz is integrated will depend on the role played in that chain by the 'Western' IOCs and the Russian or Chinese NOCs. This idea is corroborated by the information presented in **Table 7**, which shows the relative position of Kazakh oil reserves within the global context.

Table 7: Reserves, production and export of oil and gas in Central Asia

	Oil			Gas		
	Proven reserves (1000 barrels) 2009	Production (1000 barrels/day) 2009	Export (1000 barrels/day) 2006	Proven reserves TCF 2009	Production TCF 2008	Export TCF 2008
Five stans	41,046	1,996	1,249	244.40	5276.71	2568.14
Central Asia	48,081	3,030	1,799	274.7	5849.09	2764.63
Worldwide	1,333,127	79,948	63,057	6254.364	109788.55	34644.22
Top ranked/worldwide	KZ (9)	KZ (16)	KZ (19)	TKM (14)	TKM (11)	TKM (8)
% five stans	3.10%	2.40%	1.90%	3.90%	4.80%	7.41%
% world's top five	59.3	43.7%	35.59%	69.00%	52.90%	57.30%
% world's top ten	81.30%	61.3%	54.34%	84.60%	65.30%	77.60%

Source: ENI (2008) *World Oil and Gas Review*, BP (2010) *Statistical Review of World Energy* and EIA (2010) *International Energy Statistics*.

Taken together, the world ranking of KazMunaiGaz and the relative weight of Kazakh oil in the global context suggest that when this company becomes integrated within a chain its capacity for influence will be very low, except, perhaps, if it were to control all of Kazakhstan's oil production.

This idea is confirmed by the data in **Table 6**, where it can be seen that the main stakeholders in Kazakh oil production are the consortiums of 'Western' IOCs. These are followed by a heterogeneous group of Euro-Asian companies, in which the minimal presence (just 4%) of Russian companies is noteworthy. This information alone would suggest that most Kazakh oil is destined to end up in the West's *great pool*, that which is acquired, refined and commercialized by the Western IOCs in the *consumer countries* of the OECD. This situation would be very similar to what occurs in most OPEC countries and would imply a 'typical' relationship between *producer country* and *consumer country* companies. There are some differences, however, most notably the presence of the Chinese 'new' NOC.

In terms of the present analysis, and regardless of whether Kazakh oil becomes integrated within Western channels or the Chinese chain, its situation and that of the NOC KazMunaiGaz would correspond to an asymmetrical power structure whose

centre has shifted towards the ‘Western’ IOCs or the Chinese ‘new NOC. The midstream information (in **Table 6**), combined with that regarding the oil routes shown in **Table 8**, adds greater detail to this conclusion.

Table 8: Oil routes from Kazakhstan

Pipeline	Origin	Transit route	Destination
Caspian Pipeline Consortium (CPC)	Tenguiz Karachaganak	Novorossiysk (Black Sea, RU) Turkey	Western consumption
Kazakhstan-China Pipeline	Aktobe Kumkol	Atyrau (Caspian Sea, KZ) Alashankou (Xinjiang, CH)	Consumption in China
Atyrau-Samara Pipeline	Atyrau (KZ)	Samara (Volga, RU)	Western consumption
Kenyak-Orsk	Kenyak (KZ)		Russian consumption
Others (see Appendix2)	Various	Black Sea (RU) Azerbaijan Turkey Iran Turkmenistan	Western consumption

Source: WEO 2010, EIA *Country analysis, Kazakhstan* and own elaboration

The situation of Kazakh oil is very atypical. The upstream seems to be dominated by Western consortia, whereas the key players in the midstream are the ‘new’ NOCs. Most of the transit route for this oil passes through the Russian network (controlled by Transneft), with, since the construction of the Kazakhstan-China pipeline, an increasing volume heading for China. This means that Kazakh oil mainly goes, at least in an initial stage, towards Eastern Eurasia rather than to the West, with this route being controlled by the ‘new’ Russian and Chinese NOCs.

This produces a curious energy chain, in which the particular combination of upstream and midstream, and the final destinations of the crude oil that leaves the Kazakh oilfields, result in the lead firm changing as the scenario shifts from something akin to a **C3** to a **C5** and **C6**. In the first link of the chain, power is on the side of, firstly, the ‘Western’ IOCs and, secondly the Chinese NOC, whereas in the second link (**Table 6**) power clearly shifts towards, firstly, the Russian NOC and, subsequently, to the Chinese

NOC. In none of these scenarios is KazMunaiGaz the lead firm, and therefore it will not have any decision-making capacity over what is produced, for whom and for where.

Joining the two stages would create a structure that is a mixture of **C5** and **C6**. From this point of view, Kazakh oil could come to form part of two geo-energy spaces: the Russian-Western space or the Chinese one. In the former the centre of the GCC and, therefore, of decision making within the governance structure would be the result of agreement (conflictive or cooperative) between the producer-driven logic of Russia and the buyer-driven logic of the 'Western' IOCs (described in **Table 3**). In the latter the centre of the GCC and, therefore, of decision making within the governance structure would be determined by the buyer-driven objectives of the Chinese NOC.

The corollary of all this is that, according to our premises, the centre of the GCC for Kazakh oil shifts from the heart of Central Asia. Thus, who decides what, for whom and for where oil is produced will be a stakeholder from outside this space. Decisions will be made within a governance structure like the one we have already described for these cases.

4.2. The chain for gas from Turkmenistan

As in the case study above, **Table 9** shows the different stakeholders that operate in the upstream (extraction from gas fields in Turkmenistan) and the midstream (transportation of this gas to other countries). Once again, the analysis is limited by being static, providing only a short-term snapshot.

The stakeholders involved in Turkmenistani gas correspond to three of the types described in **Table 3**:

- 1) As in the previous case study, Turkmengaz can be considered as an 'old' NOC and, to date at least, its behaviour has been very similar to that of the investment companies of OPEC countries (Tomillo, 2011). However, it is much less relevant on the global stage than are these companies, it being at the bottom of the top 100 companies worldwide. This is despite the fact that the discovery of the giant Yolotan Sur gas field (see Appendix 3) has seen it move up the rankings.

Another stakeholder in relation to Turkmenistani gas is the Iranian National Oil Company, which is a prime example of an 'old' NOC; however, due to the economic sanctions affecting Iran it has been unable to invest enough to renew its infrastructure and develop its gas sector.

- 2) The same type of 'new' NOCs that invest in Kazakh oil, and with the same objectives and priorities.
- 3) 'Hybrid' IOCs, although in this case new kinds of company have recently entered the sphere of international energy relations. On the one hand, within a more European framework, there are electricity companies who are seeking to enter the upstream, examples being the Central European firms RWE and OMV. On the other hand, there are 'small' companies from the Middle East whose final objective could be to develop a 'production' alliance.

In terms of stakeholder involvement the case of Turkmenistani gas is a complete exception, unlike what was noted above for Kazakh oil, where the upstream appears to be a 'typical' case of a producer country. Specifically, Turkmenistan is an extractor/producer territory which is opening up to foreign investors, among which the large 'Western' IOCs are almost completely absent. In terms of energy relations, therefore, this is a completely new scenario with an as-yet undefined geo-energy space, although what seems likely to emerge are energy chains across a region stretching, west to east, from Central/Eastern Europe to the Pacific, and, north to south, from Russia to the Indian Ocean.

Whatever the nature of the future geo-energy space that is created the final behaviour of the value chain in which Turkmenistan becomes integrated will — as in the case of Kazakh oil, and on the basis of current data — depend above all on the role played within this chain by the Chinese and Russian NOCs. This idea is corroborated by the information in **Table 7**, which shows the relative position of Turkmenistan's gas reserves within the global context. As in the previous case study, both the world ranking of Turkmenistan and the relative weight of Turkmenistan's gas reserves in the global context suggest that when this company becomes integrated within a value chain its capacity for influence will be low.

Table 9: Principal upstream and midstream stakeholders for gas from Turkmenistan

	Upstream		Midstream	
Stakeholders	Production		Transportation	2010
NOCs	Turkmengaz (TK)		Turkmengaz (TK) Uzbekneftgaz (UZ) KazMunaiGaz (KZ)	
Total 'old' NOCs Central Asia		Yes	Total 'old' NOCs Central Asia	
IOCs			Via 'others' (see Table 7)	?
Hybrid	RWE (GER) OMV (AUS)			
Total 'Western'		No	Total 'Western' IOCs	
Hybrid	Petrofac (UAE) Gulf Oil & Gas (ME)			
NOCs			Iranian National Oil Co.	
Total Middle Eastern 'hybrid'		Yes	Total 'old' NOCs	31%
IOCs	LG (KOR) Hyundai (KOR)			
Total 'Eastern' consumer IOCs		Yes		
NOCs	Itera (RU) Zarubezhneft (RU) Rosneft (RU)		Gazprom (RU)	
Total 'new' producer NOCs		Yes	Total 'new' producer NOCs	43%
NOCs	CNPC (China)		CNPC (China)	
Total 'new' consumer NOCs		Yes	Total 'new' consumer NOCs	26%
Total Euro-Asian (without Central Asia)		Yes	Total Euro-Asian (without Central Asia)	100%

Source: WEO 2010, Tomillo, 2011 and own elaboration

Although the information available regarding Turkmenistan is less detailed than that for Kazakh oil the data provided by the WEO 2010 and Tomillo (2011) help to interpret tables 9 and 10. Despite Turkmenistan being a closed and hermetic country the most important upstream stakeholders are the Russian NOCs and the Chinese company, CNPC. At present, Turkmenistan's strategy seems to be aimed, as far as possible, at freeing itself from Russian influence in its energy sector, with greater priority being given to the Chinese and Iranian companies, as well as what we have classified here as the 'hybrid' IOCs. As Tomillo (2011) points out, this is producing a diversification of energy alliances, which in turn is promoting three scenarios:

- a) an asymmetrical situation when an 'old' NOC becomes integrated in a chain with the 'new' NOCs;
- b) a symmetrical relationship between 'old' NOCs with similar objectives; and
- c) a symmetrical relationship between an 'old' NOC and the Eastern and Western 'hybrid' companies.

Observation of the midstream and the information shown in **Table 10** confirms that this is, *a priori*, a diverse and diversified situation.

Table 10: Gas routes from Turkmenistan

Pipeline	Origin	Transit route	Destination
CAC – 3	Dauletabad (TK) Okarem (TK)	Uzbekistan Kazakhstan Alexandrov Gay (RU)	Western consumption
Turkmenistan-China Pipeline	Bagtyarlak (TK) Yolotan Sur (TK)	Uzbekistan Kazakhstan	Consumption in China
Dauletabad – Salyp Yar	Dauletabad (TK)	Iran	Consumption in Turkey or the West
Korpezhe – Kart Kui	Korpezhe	Iran	Iran or Turkey or the West
Others (see Appendix5)			
TAPI (signed October 2011)	Yolotan Sur?	Afghanistan Pakistan India	Consumption in India and Pakistan
Nabucco	?	Azerbaijan Georgia Turkey Bulgaria Romania Hungary Austria	Consumption in Central and Eastern Europe
South Stream	?	Black Sea (RU) Bulgaria Serbia Hungary Austria Slovenia Greece	Consumption in Central and Eastern Europe

Source: WEO 2010, Tomillo, 2011 and own elaboration

In the case of gas from Turkmenistan, comparison of the upstream with the midstream and the (existing) exit routes reveals greater coherence than in the previous case study. Here the strong influence of the Russian and Chinese NOCs, combined with (as in both case studies) the country's maintenance or creation of its own pipelines (the CAC-3, which passes through post-Soviet space, and the Turkmenistan-China pipeline, with its clear links to the *Celestial Empire*) corresponds to a (dual) **C2** scenario, which over time could become a **C5**.

Whether or not the other two energy-chain options we have noted will become consolidated will depend on the outcomes of projects currently on the table regarding the transportation of gas from Turkmenistan.

The alliance between Turkmengaz and the Iranian NOC is, at present, one that would correspond to a **C1** scenario. This alliance is the result of Iran's need to fulfil its gas contracts with Turkey. It remains to be seen if this alliance will continue in its present form or whether it will join with the as-yet hypothetical Nabucco pipeline. Were the latter to occur a curious **C4** scenario would be produced, in which one or more of the 'old' NOCs would become integrated within an energy chain of 'hybrid' IOCs (which in geographical terms are European). This could lead to highly complex stakeholder games, as the imaginable **C4** scenarios would see the entry of numerous stakeholders, ranging from European electricity companies through Turkish intermediaries to producers in the Caucasus, especially the Azerbaijani company SOCAR.

In the present context, gas from Turkmenistan corresponds to a **C2** scenario with a clearly asymmetrical power structure. This structure could become a **C5** were the energy chains to shift from the Russian producer-driven logic to the buyer-driven model of Chinese firms. In both cases, however, the centre of the geo-energy space will shift towards the East (north-east or south-east of Turkmenistan) and beyond the strict territory of the five *stans*. In neither scenario would Turkmengaz seem destined to be the lead firm, and therefore the decisions about what is produced, for whom and for where will be made in a GCC whose centre has moved away from Central Asia.

The remaining possible **C4** scenarios, linked to hypothetical energy chains which would shape more westerly geo-energy spaces (whether Turkmenistani-Iranian-Turkish,

Turkmenistani Caucasian-European or, in the case of TAPI, Turkmenistani-Afghan-Indian), are far from clear in terms of who might be the lead firm and, therefore, what kind of governance structure any GCC would have. What these scenarios have in common, however, is that the type of stakeholders involved in the energy chains and the space in which such chains develop will make them very different to the 'Western oil' scenario.

4.3. Uranium from Kazakhstan

The case of uranium has certain commonalities with the cases of oil and gas. It is also a specific energy resource that cannot be delocalized¹⁴ and in which three stages can be identified: the upstream (extraction of uranium and manufacture of yellowcake [U₃O₆]), the midstream (transportation, refinement, production of uranium hexafluoride gas (UF₆) and preparation of fuel pellets from uranium oxide powder [UO₂]) and the downstream (enrichment of uranium and the generation and commercialization of electricity)¹⁵. Therefore, as in the case of hydrocarbons the companies involved in the international energy chains may be integrated, i.e. present in all three stages, or specialize in just one of them. Thus, although the terminology used below differs from that of the previous case study the types of stakeholders are comparable.

For the purposes of this paper a national mining company (NMC) is considered to be equivalent to an 'old' NOC, an integrated producer (IP) is comparable to an international IOC, a Western demand company (WDC) would be akin to a 'hybrid' IOC and, in this specific case, an Eastern producer (EP) and a Russian producer (RusP) are equivalent to a 'new' NOC. In the case of uranium these categories are diffuse, since the final behaviour of each of them is subject to restrictions originating in the bipolar energy model imposed by the world order that resulted from the Yalta Conference.

¹⁴ In this case study it is only considered as an energy asset.

¹⁵ For a detailed account of value chains and stakeholders related to the energy produced from uranium, see the World Nuclear Association (<http://www.world-nuclear.org/info/inf03.html>) or Cirera, Benach & Rodríguez (2007).

Indeed, it is no coincidence that the countries which have developed a nuclear industry are those with a seat on the United Nations Security Council.

The consequence of the above is that only a select group of countries can enrich uranium and, therefore, only an even more select group of companies are able to perform this task. For our purposes, these restrictions have two consequences:

- 1) It is impossible for NMCs to integrate in the upstream unless they belong to the group of countries that are authorized to enrich uranium or carry out nuclear fission; and
- 2) The lead firms will always be those companies that produce and commercialize enriched uranium, as it is they which give 'value' to the uranium ore.

Thus, in the current nuclear order only the IPs, the EPs and the RusPs can be lead firms, which means that KazAtomProm, by virtue of being an NMC (assimilated to an 'old' NOC), will have few opportunities for power within the uranium governance structure. However, there are three reasons why we wished to include this case study:

- 1) In 2010 Kazakhstan was the world's top producer of uranium (33% of the worldwide total), it was ranked second in recoverable reserves (12.14% of the worldwide total, behind Australia) and, in terms of volume produced, KazAtomProm was among the world's top three, after Cameco and Areva (WNA, 2011). Therefore, we do not consider KazAtomProm to be a minor stakeholder.
- 2) In the USSR, Kazakhstan was the Soviet nuclear territory par excellence, with nuclear weapons testing being carried out in the Kazakh region of Semipalatinsk. This is most likely why, following the collapse of the Soviet Union, that Semipalatinsk was the site chosen for the signing of the Central Asian Nuclear-Weapon-Free Zone (CANWFZ), which binds together the five *stans*. Kazakhstan also declared that it would not enrich uranium within its territorial borders. However, in the last year KazAtomProm has entered into agreements with all the world's large producers and, as can be seen in Appendix 5, it has even signed agreements to enrich uranium in Russia or produce fuel in (or with) China and Japan. Therefore,

3) Although the production of enriched uranium is highly regulated at the international level, the information available regarding Kazakh uranium (see **Appendix 5**) points towards a complex set of alliances within the Euro-Asian energy space that is emerging following the disappearance of a bipolar world order. This process of forming alliances, were it to continue, would transform a national mining company into a national integrated producer, or in the principal terminology of this paper, an ‘old’ NOC into a ‘new’ NOC.

Table 11: Principal upstream stakeholders for uranium from Kazakhstan

	Upstream		Midstream	
Stakeholders	Uranium extraction	%		%
NMC	KazAtomProm (KZ)	45.59	KazAtomProm (KZ)	34
Total national mining Central Asia		45.59		
IP	Areva (FRA) Cameco (CAN)	9.53 5.52	Cameco (CAN)	
Total ‘Western, integrated’ companies		15.05		
WDC	UraniumOne (CAN)	10.04		
Total ‘Western’ companies		25.05		
EP	CGNPC (CH)	2.68	Jianzhong Nuclear Fuel (CH)	
EP	OSSC (IND)	0.03		
Total ‘emergent, integrated’ companies		2.71		
EP	Japanese consortia (JAP)	4.28	Kansay Electric & Sumitono Corp (JAP)	
Total ‘Eastern’ companies		6.99		
RusD	UraniumOne (RUS)	10.04	TVEL (RU)	
RusP	ARMZ and others (RUS)	12.29	TENEX (RU)	
Total Russia		22.33		
Total Euro-Asian (without KZ)		29.32		

Source: World Nuclear Association and own elaboration

In light of these reflections there would appear to be two possible broad scenarios:

1) No significant change occurs in the nuclear world order. In this case two separate scenarios, a **C3** and a **C2**, would emerge, the first led by Areva and including Cameco (IP) and the Japanese consortia (EPs), and the second led by the Russian NOCs. In both cases the value chain would be buyer driven and,

therefore, Kazakh uranium would be integrated within two asymmetrical power structures that would give rise to two separate geo-energy spaces which would strongly resemble those of the bipolar world; as in that world there would be some other stakeholders, such as the demand/producer companies of China and India.

- 2) If there is a change in the nuclear world order, KazAtomProm would become a 'new' NOC and, therefore, we would be faced with a **C5** and/or **C6** scenario in which this company could be the lead firm (due to its importance in terms of production and the possibility that 'its' government would erect entry barriers) and where the GCC would shift towards a producer-driven logic. This situation would be unprecedented in the world of nuclear relations (at present only Canada is in a position to aspire to such a situation), but it could occur if things develop along the lines described above.

Among all the possible scenarios described in the three case studies it is only the latter which would see the centre of a geo-energy space being located within one of the five *stans*. However, even if we accept that KazAtomProm could become the lead firm the future of international energy relations based on nuclear energy is highly uncertain.

5. Conclusions

The process of reconstructing energy chains and exploiting natural resources in Central Asia following the break-up of the Soviet Union is unfolding in a global context of energy transition, one in which a new geo-energy space is taking shape in the Central Asian region.

Application of GCC methodology has provided a suitable analytic framework for studying the value chains of energy products. The analysis shows that the behaviour of chains is determined by the type of company ('old' NOC, 'new' NOC, 'Western' IOC, 'hybrid' IOC) that becomes the lead firm in the chain. Depending on the type of company, the objectives will range from merely economic to geo-political in nature.

The three case studies (oil and uranium from Kazakhstan and gas from Turkmenistan) reveal different energy value chains and a high degree of uncertainty over the direction these chains will take. In the case of Kazakh oil the upstream is controlled by 'Western' IOCs, although their dominance is under threat from the arrival of the Chinese 'new' NOC, CNPC. The midstream is in the hands of Russian and Chinese NOCs, such that Kazakh oil mainly ends up heading for eastern Eurasia. The Kazakh 'old' NOCs occupy a marginal position in both the upstream and the midstream, it being almost impossible for them to become lead firms and control the chain.

Western IOCs have a completely marginal role in the chain for gas from Turkmenistan, and although the Russian NOCs have some influence in the upstream it seems likely that the Chinese NOCs (and perhaps the Iranian NOC) will become established as the lead firms in this chain.

In the case of uranium from Kazakhstan the future nature of the energy chain is far from clear. Although KazAtomProm controls almost 50% of the uranium extraction process the important hurdles it faces in terms of accessing the downstream (uranium enrichment) make it difficult to imagine, at present, that the Kazakh 'old' NOC could control the chain.

The results of the case studies enable a number of conclusions to be drawn in relation to the four objectives set out in the introduction (to determine whether there are regional value chains that are truly proper to the region, to identify the power relations that operate in these energy chains, to consider whether, in light of these power relationships, conflict or cooperation is the most likely outcome between the five countries of the region, and to suggest which elements the regional energy governance structure should have). In the context of these objectives we sought to answer the initial question regarding the possibility of regional stakeholders using their own criteria to manage the natural resources (energy, minerals and water) that are to be found on and below the surface of their territory. The conclusions to be drawn are as follows:

The three case studies show that the GCCs which are now developing extend beyond the borders of the territory comprising the five *stans*. With the exception of the hypothetical case of Kazakh uranium, the GCCs described in this paper are

characterized by asymmetrical power relations in which the local 'old' NOC is always the weakest link in the chain. Hence, in all the scenarios described the centre of the value chain has shifted beyond the region's borders, through the shaping of a larger Euro-Asian energy space.

It is therefore difficult to predict whether the resulting scenario will be one of regional conflict or cooperation, although one can state that since neither Kazakhstan nor Turkmenistan have the capacity to decide how their energy resources are managed (neither the 'what', the 'how', the 'for whom' nor the 'for where') it is highly improbable that they will, above and beyond an expressed wish, be able to make a commitment to a regional policy based on the exchange of energy for water.

From this point of view, and given that the scenarios we have described imply the integration of 'old' NOCs and local energy resources within GCCs whose lead firms are rarely Western but rather almost always Euro-Asian companies (especially, Russian, Chinese and, perhaps in the future, Iranian and Turkish), we believe it would be advisable for these stakeholders and their respective governments to be included in any regional governance structure that is developed to manage the region's energy, water and environmental problems.

Therefore, and in response to the initial question, we do not believe that regional stakeholders will be able to use their own criteria to manage their natural resources.

References

- Bair, J. 2005. Global Capitalism and Commodity Chains: Looking Back, Going Forward. *Competition and Change*, 9 (2): 153-180
- Barnes, J. and Kaplinsky R. 2000. Globalization and the Death of the Local Firm? The Automobile Components Sector in South Africa. *Regional Studies*, 34 (9): 797-814.
- Bunker, S. and Ciccantell, P. 2007. *An East Asian World Economy: Japan's Ascent with Implications for China*. Baltimore, MD: The John Hopkins University Press.
- Ciccantell, P. and Smith, D. 2009. Rethinking Global Commodity Chains: Integrating Extraction, Transport and Manufacturing. *International Journal of Comparative Sociology*, 50 (3-4): 361-384.
- Cirera, A., Benach, J. and Rodríguez, E. 2007. ¿Átomos de fiar? Impacto de la energía nuclear sobre la salud y el medio ambiente. Madrid: Ed. Los libros de la Catarata.
- Clancy, M. 1998. Commodity Chains, services and development: theory and preliminary evidence from the tourism industry. *Review of International Political Economy*, 5 (1): 122-148.
- Coe, N., Dicken, P. and Hess, M. 2008. Global production networks: realizing the potential. *Journal of Economic Geography*, 8: 271-295.
- Davis, J.H. and Goldberg, R.A. 1957. *A Concept of Agribusiness*. Boston: Harvard University.
- Gereffi G. and Korzeniewicz, R. (eds) 1994. *Commodity Chains and Global Capitalism*. Westport: Greenwood Press.
- Gereffi, G. 1994. The Organization of Buyer-Driven Global Commodity Chains: How U.S Retailers Shape Overseas Production Networks. In *Commodity Chains and Global Capitalism*, ed. G. Gereffi and R. Korzeniewicz, 95-112. Westport: Greenwood Press.
- Gereffi, G. 1996. Global Commodity Chains: New Forms of Coordination and Control Among Nations and Firms in International Industries. *Competition and Change*, 1(4): 427-439.
- Gereffi, G. 1999. International Trade and Industrial Upgrading in the Apparel Commodity Chain. *Journal of International Economics*, 48 (1): 37-70.
- Gereffi, G. 2003. The International Competitiveness of Asian Economies in the Global Apparel Commodity Chain. *International Journal of Business and Society*, 4 (2): 71-110.
- Gereffi, G. 2006. *The New Offshoring of Jobs and Global Development*. Geneva: ILO.
- Gereffi, G., Humphrey, J. and Sturgeon, T. 2005. The Governance of Global Value Chains. *Review of International Political Economy*, 12 (1): 78-104
- Gibbon, P., Bair, J. and Ponte, S. 2008. Governing Global Value Chains: An Introduction. *Economy and Society*, 37 (3): 315-338.
- Gwynne, R. 2006. Governance and the wine commodity chain: Upstream and downstream strategies in New Zealand and Chilean wine firms. *Asia Pacific Viewpoint*, 47 (3): 381-395

Hopkins T.K. and Wallerstein, I. 1994. Commodity Chains in the Capitalist World-Economy Prior to 1800, in Gereffi, G. and M. Korzeniewicz (eds), *Commodity Chains and Global Capitalism*, Westport: Praeger, pp.17-50.

Hopkins, T.K. and Wallerstein, I. 1986. Commodity chains in the world economy prior to 1800, *Review*, 10: 157–170.

Huici, L. 2010- Marco institucional regional y gobernanza, *Información Comercial Española*, 857: 97-110

IEA. 2011. *World Energy Outlook 2010*. Paris: OECD

Kaplinsky, R. 2006. How can agricultural commodity producers appropriate a greater share of value chain incomes?. In *Agricultural Commodity Markets and Trade: New Approaches to Analyzing Market Structure and Instability*, ed. A. Sarris, A. and D. Hallam, 356-379. Cheltenham: Ed. Edward Elgar.

Kaplinsky, R. and Morris, M. 2002. *A Handbook for Value Chain Research*. IDRC.

Kerebel, C. 2009. Qu'est-ce que la gouvernance globale de l'énergie ? Les termes du débat. In *La gouvernance mondiale de l'énergie*, ed. J.H. Keppler and C. Kérébel, IFRI. Available online: http://www.ifri.org/files/Energie/Sommaire_Gouvernance_liens.pdf

Lema, R. 2010. Adoption of Open Business Models in the West and Innovation in India's Software Industry. *IDS Working Papers*, 62.

Malassis, L. 1979. *Economie agro-alimentaire*. París: Cujas.

Mañé, A. 2011b. Repensando la política energética. Reflexiones a partir de unas lecturas veraniegas. *Revista de Economía Crítica*, 12: 226-238

Mañé, A. 2011. Hidrocarburos en Kazajastán: nuevas realidades y enfoques para el estudio de las relaciones energéticas de Asia Central. *Revista de Economía Crítica*, 12: 131-154

Mañé, A. 2010. Año de crisis: perspectivas y alianzas en Asia Central. In *Anuario Asia-Pacífico 2009 (edición 2010)*, AA.VV., 41-48. Barcelona: Fundación CIDOB.

Mañé, A. 2005. European Energy Security: towards the creation of the geo-energy space. *Energy Policy*. 34: 3773-3786

Mañé, A.; de la Cámara, C. 2010. Asia Central: una región en transición hacia la pobreza energética. *ICE. Revista de Economía*; 857: 43-62

Melosi, M. 2006. Energy Transition in Historical Perspective. In *Energy and Culture*, ed. Brendan Dooley, chapter 1. Ashgate Studies.

Martin-Amouroux, J.M. 2008. *Charbon, Les métamorphoses d'une industrie*. Paris : Éditions TECHNIP.

Martínez, J. and Vidal Villa, J.M. 2000. *Economía Mundial*. Madrid: McGrawHill.

Noël, P. 1999. Transnational anew, competitive at last: The oil market in the globalisation era. *IEPE Working Paper*. University of Grenoble

Observatorio de Asia Central. Many years. Chronicles of the correspondents. Available online: <http://www.asiacentral.es/corresponsales.php>

- Patel-Campillo, A. 2010. Transforming Global Commodity Chains: Actor Strategies, Regulation, and Competitive Relations in the Dutch Cut Flower Sector. *Economic Geography*, 81(1): 79-99.
- Pelupessy, W. and van Kempen, L. 2005. The Impact of Increased Consumer-orientation in Global Agri-food Chains on Smallholders in Developing Countries. *Competition and Change*, 9 (4): 257-381.
- Ponte, S. 2002. The Latte Revolution: Regulation, Markets and Consumption in the Global Coffee Chain. *World Development*, 30 (7): 1099-1122.
- Porter, M. 1985. *Competitive Advantage*. New York: Free Press.
- Raikes, P., Jensen, M., and Ponte, S. 2000. Global Commodity Chain Analysis and the French Filière Approach: Comparison and Critique. *Economy and Society*, 29 (3): 390-417.
- Schmitz, H. 2005. *Value Chain Analysis for Policy Makers and Practitioners*. Geneva: ILO.
- Schmitz, H. 2006. Learning and Earning in Global Garment and Footwear Chains. *European Journal of Development Research*, 18 (4): 546-571.
- Sheer, M. 2009. *Autonomía Energética*. Barcelona: Icaria-Antrazyt.
- Smeenk, T. 2010. Russian Gas for Europe: Creating Access and Choice. Underpinning Russia's gas export strategy with Gazprom's infrastructure investments. *Clingendael International Energy Programme*. Available on line: http://www.clingendael.nl/publications/2010/20100622_dissertation_CIEP_Tom%20Smeenk.pdf
- Sokol, M. 2007. Space of flows, uneven regional development and geography of financial services in Ireland. *Growth and Change*, 38 (2): 224-259.
- Soldevila, V., Viladomiu, L. and Francès, G. 2009. Catalanian pork value chain's resilience: ready for environmental challenge?. *AgEcon Research in Agricultural and Applied Economics*. Available online: <http://purl.umn.edu/58134>
- Sturgeon, T. and van Biesebroeck, J. 2011. Global value chains in the automotive industry: an enhanced role for developing countries?. *International Journal of Technological Learning, Innovation and Development*. 4: 181-205.
- Sturgeon, T., Memedovic, O. and van Biesebroeck, J. 2009. Globalisation of the automotive industry: main features and trends. *International Journal of Technological Learning, Innovation and Development*, 2 (1): 7-24
- Tomillo, U. 2011. *Tukmenistán en la escena energética internacional*. Master Thesis. Máster en Estudios Arabes e Islámicos. Universidad Autónoma de Madrid
- Vagneron, I. , Faure, G. and Loeillet, D. 2009. Is there a pilot in the chain? Identifying the key drivers of change in the fresh pineapple sector. *Food Policy*, 34 (5): 437-446.
- World Bank. 2009. *The Petroleum Sector Value Chain*. Washington, D.C: World Bank.