



BULLETIN

FACILITATION OF TRANSPORT AND TRADE IN LATIN AMERICA AND THE CARIBBEAN

Reflections on the role of logistics in the sustainable exploitation of natural resources in Latin America and the Caribbean

Background

This bulletin examines the interrelations that exist between logistics and natural resources and addresses different theoretical approaches for analysing global natural resource production chains and networks. Many of the methodologies analysed focus either on the resources or on the stages of international trade and omit the importance of logistics infrastructure, which is the logical and physical thread that connects the different links in the network. Not only do properly coordinated logistics allow flows of materials to be mobilized in an appropriate, timely, safe way and at a competitive cost; they also have an enormous impact on the interconnection of territories, on the connectivity and accessibility of transport services and on the mitigation of negative externalities that affect the environment and the population.

In many Latin American and Caribbean countries, the exploitation and marketing of natural resources continues to be the main source of income and the principal engine of growth. For that reason, and given the urgent need to promote productive diversification through progressive structural change in those countries (ECLAC, 2016), numerous institutions see global value chains as a tool for attaining that objective. However, one of the prerequisites for the crystallization of such value chains is the physical and technological support that logistics can provide for their efficient and competitive operation. This necessarily requires that the region's logistical infrastructure be managed in a different way, given that the current approach was designed to export large volumes at the lowest cost and in the shortest time possible, with no consideration to encouraging productive linkages and no proper management of the negative externalities created.

This issue explores the essential link between logistics and the exploitation of natural resources. It briefly examines how the different theoretical and analytical conceptions of global trade interconnections that exist have failed to take full account of the central role played by logistics, which has affected the ways in which the various nodes and links in global value chains manifest themselves on the ground, together with the social and environmental implications that this has for the region's development.

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The views expressed in this document are those of the authors and do not necessarily reflect the views of the Organization.

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Although the globalization of markets has been chiefly characterized by increased interdependence among States and their economies as a result of exchanges of persons, goods, services, information, values and habits, it has also increased the scale of target markets, generating increased competitive pressures and a growing deterritorialization and denationalization of development processes. Accordingly, the existing model for natural resource governance requires a new multiscalar approach that underscores the importance of interactions between the local and global scales, especially as regards the flow of raw materials and the growing, decisive role played by logistics in that relationship.

I. A holistic look at global natural resource chains and networks

For many of the region's countries, effective integration into global value chains is essential for their future sustainable development. This is because of the advantages those chains offer for promoting trade in manufactured goods with added value, increasing quality employment, balancing demand while preserving the basic sectors of the economy, reducing exposure to currency volatility, encouraging investment in strategic sectors, along with many other advantages (World Bank, IDB, ECLAC, 2016).¹

However, the structure of global value chains is determined by the characteristics of the resource as well as by the speed, quality, flexibility and costs of the full chain. The ability of a local company to join one of those networks does not therefore depend solely on its individual performance but also on its historical and social background, its geographical location and the quality of the available infrastructure.

Although moving people and goods has been a key element in development throughout history, the deterritorialization of production has made infrastructure and logistics services (including transport) basic requirements for global interaction. Ongoing technological progress also leads to radical changes in the territory and nature, in forms of consumption and in the economic infrastructure required to meet demands that are increasingly exacting and niche-based. In other words, to make progress with productive transformation and to harness the full potential of global value chains, logistics (both physical and service-based) must be integrated to provide the connectivity and fluidity necessary for the required amounts of primary products and intermediate goods to move between nodes with the necessary levels of quality, safety and timeliness and at internationally competitive costs.

Nevertheless, the different theoretical conceptualizations of global value chains have failed to analyse the importance of logistics infrastructure and the impact of the process on the territory and the population. This is the case, to a greater or lesser extent, from the first approaches to the issue —under the successive denominations of “commodities chains” (1987), “consumption chains” (Storper, 1992), “production chains” (Dicken, 1994) and “commodity circuits” (Johnson, 1996)— to the recent developments of provisioning systems, actor-network theory, global production networks and other theoretical frameworks for their analysis.

Thus, for example, in 1987 Hopkins and Wallerstein (2000) developed the concept of the “commodities chain”, defined as a network of labour and production processes whose end result is a finished commodity. The authors developed the concept to explore how surplus value was distributed among owners and, consequently, how “unequal exchange” occurred in practice. They analysed the main productive operations, the central properties of each operation and the geographic and political dispersion of those operations. However, because of the influence of the world-systems theory they had previously developed, their analysis focused on global dynamics and was structured around such concepts as the centre and the periphery, with only secondary importance given to the local level. In turn, Fine and Leopold (1993) sought to highlight the different ways in which production and consumption interact, focusing on how demand for resources determines their importance at different historical moments, with the importance of one resource being transferred to another depending on the geopolitical and economic-political context. Thus, different resources are constructed ideologically and, as a result, the task was to trace not only their chains, but also the discourse, knowledge and representations of the historic moment. In this way, the analysis of production, distribution, marketing and consumption could be connected with the cultural elements that surround those processes. In turn, Gereffi (1995) established that a “commodity chain” has four main characteristics: an input-output structure, which includes a group of products and services connected through a sequence of activities intended to incorporate an added value; a distinctive territoriality, which includes the location of the raw materials and of their production, export and marketing; a particular structure of governance, which refers to the power relationships that determine the allocation of financial, material and human resources within the chain; and the institutional context, comprising the role of the government, trade unions and other institutions that regulate those issues. In turn, Kopytoff (1949) and Crang (1996) expanded this with the concept of “commodity

¹ Global value chains are a tool that allows the changing patterns of global production to be analysed, geographically disperse activities and actors within a particular industry to be interlinked and the roles that developed and developing countries alike play within them to be determined (Gereffi and others, 1994).



biographies”, to link consumption as a local contextual process with the networks, representations and positions of consumers.

Towards the end of the twentieth century, the concept attracted the interest of numerous researchers and decision-makers who saw global value chains as a model for development in the context of a globalized economy. For example, authors such as Gereffi and Korzeniewicz (1994) proposed the concept of “global commodity chains”, based on the chains of added value developed by scholars of international business. The authors connected this concept directly with the global organization of industry, according to which global commodity chains are a process through which technology is combined with material inputs (natural resources) and labour inputs, after which the processed inputs are assembled, sold and distributed, thus forming inter-organizational networks grouped around a final product that links consumers and their families to companies and States. The main emphasis of their work was on cross-border coordination along with the growing importance of global buyers, characterized as scattered and organizationally fragmented, with emphasis on the role of distribution.

Whatmore and Thorne (1997), following the actor-network theory developed in the 1980s, studied fair trade networks for coffee.² Their theoretical approach revealed connections and interrelations through the concept of the “network”, illustrating how a cup of coffee is produced over a network composed of a variety of geographically dispersed actors. Although this perspective is useful to decipher the locations and processes involved in the transformation of a natural resource, it concentrates on the finished product itself as a key actor, to the detriment of the human actors involved in the network and rendering local producers and their contributions to the process invisible (Hartwick, 2000). To address this issue, Hartwick (1998; 2000) proposed an alternative method of analysis that connects the nodes of production, distribution and consumption with the social, cultural and natural conditions involved in the movement of commodities, demonstrating the impact of one on the other. In contrast to earlier theories, this approach sees flows of commodities (their vertical dimension) as the connection between nodes seen as locations and not as stages or boxes, putting the focus on persons and places and thus widening the economic analysis to incorporate social, cultural and environmental relations. Similarly, authors such as Leslie (2012), Ramamurthy (2004) and Barrientos (2014) advocate a feminist approach to global

value chains as an analytical tool for exploring how class, gender, ethnicity, sexuality and nationality intersect.

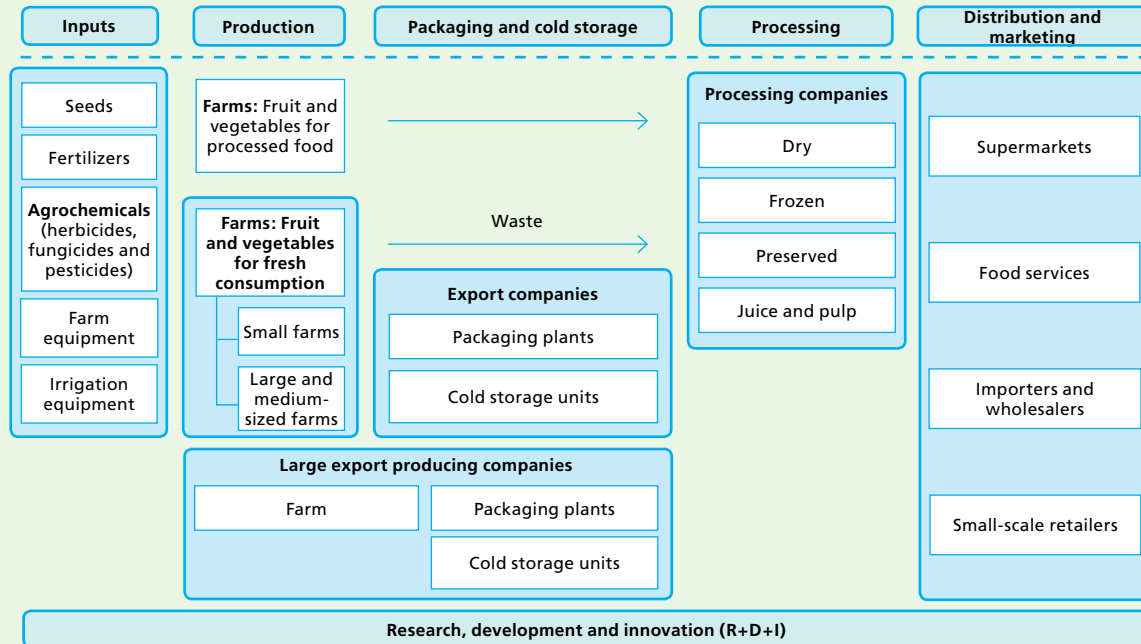
Finally, the most recent studies into global value chains have gradually begun to address both the global and local dimensions. At the global level, they consider the input-output structure, the geographical scope and the governance structure of the chain. In turn, at the local level, they deal with the involvement of individual countries in chains, the creation of forward and backward linkages, the local institutional context and the key actors within the industry, with which they in some way cover the entire input-output process from the conceptualization of a product or service to its consumption (Gereffi and Fernandez-Stark, 2016). In most cases this structure is depicted by means of a set of boxes connected by arrows to show the flows of tangible and intangible goods and services, which are critical in mapping the value added at each stage in the chain (see diagram 1, which portrays an agricultural value chain). Those boxes are subdivided into research and design, inputs, production, distribution and marketing, and sales. Some cases also include recycling and reverse logistics, which are beginning to serve as differentiating elements in markets with greater purchasing power and socioenvironmental awareness.

In line with the foregoing, Gereffi and others (2005) propose a typology for analysing how a particular chain is controlled and coordinated when certain actors within it have more power than others. In their model, as illustrated in the following diagram, the authors suggest the existence of five types of control: market, modular, relational, captive and hierarchical. In this type of study, the main unit of analysis is the global level and the focus is the company, where the unequal distribution of wealth throughout chains is the result of competition between firms and of innovation (in Hartwick, 1998). While this approach is a step forward compared to earlier ones, it still fails to establish an adequate link between consumption and production or to address the social relations that occur along the territories that the chain crosses.

The failure of this analysis to link consumption and production and its omission of the importance of logistics processes and the externalities created for the population and the environment can, in certain cases, be extreme, when the image of a commodity at the consumption end of the chain is totally opposed to the material conditions that arise in its production. Underdevelopment, unequal exchange, benefit flows and asymmetries of power are kept hidden behind the projected image of the good or service, thereby evading the responsibility its consumption generates in the shape of negative social and environmental impacts (Appadurai, 1949).

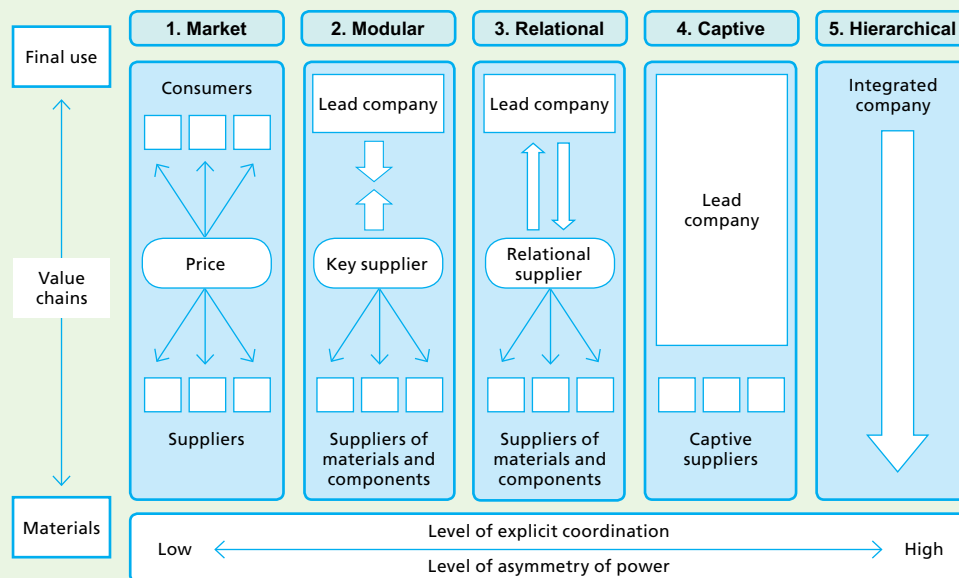
² This theory identifies both human beings and objectives and discourse as key actors within knowledge production networks, focusing on the participation of resources such as equipment, machinery, money, data or power. Thus, the theory analyses the interaction between the human and non-human actors, and the way in which the latter are created.

Diagram 1
Global value chain for fruit and vegetables



Source: Prepared by the authors, on the basis of Gereffi and Fernandez-Stark, 2016:9.

Diagram 2
The five types of control (governance) of global value chains



Source: Prepared by the authors, on the basis of Gereffi and others, 2005.

Some of these shortcomings are resolved by the concept of global production networks, which seeks to incorporate the existing configurations in a network, encompassing all the actors and all the relevant relationships beyond the focus on companies and the separation of nodes in analyses of global value chains (Coe and others, 2008). These global production networks mould—and are in turn moulded by—social, political and cultural contexts, where each element and industrial cluster in a network is anchored in specific locations, both materially (factors of production) and in less tangible ways (social, cultural and institutional relations) and where every network node develops its own identity and forms of action and thought in response to the particularities of each place.

All these theories have contributed to the debate and to the visibility of natural resources as complex, changing elements that produce and reproduce social relations, cultural identities and economic power. However, given that the approach chosen for the analysis determines the scope of the study, the failure to consider physical flows (logistics), or their consideration only as a secondary element, generates a disconnect between production, distribution and territory. This omission of the importance of infrastructure and logistics services, as well as of energy and associated pollutant emissions, can probably be explained by the fact that academia analyses logistics as a derived demand, seeing transport as a function that is subject to other processes and the result of the physical flows that they generate.

Although each node of the network interacts with nature—for example, production implies flows of energy and the chemical and physical transformation of natural elements—the link between nature and the processes whereby goods and services are produced, distributed and consumed has not been closely examined (Coe and others, 2008). All network nodes impact nature in two main ways: first, through the inputs that production processes take from the natural environment as resources and, second, through their outputs into the environment in the form of pollution and waste. The uneven distribution of production and of demand for natural resources between regions generates an unequal exchange of environmental externalities and unequal ecological footprints (Leff, 2005).

The rising interdependence of commercial, financial and cultural flows and the growth in their volumes has led, in turn, to increased awareness within societies that the world is a closed system, that natural resources are limited and that environmental risks are shared. This new awareness has driven green commerce, fair trade and products that include waste recycling processes at end of their useful lives (reverse logistics), and this will have a

profound effect on how sectors are organized, given that competition will not be based solely on the final price. For all these reasons, and given that global production networks are essentially structures that depend on production and where production, distribution and consumption are barely separable, logistics and other infrastructure services play an increasingly important role in networks and must therefore be paid appropriate attention in their analysis.

II. Logistics depend on prevailing governance

Latin America and the Caribbean have seen their exploitation and transformation of natural resources expand as a result of their increased participation in global trade. However, such factors as peripheral integration into global trade and low levels of participation in natural resource networks and chains have prevented the region from taking full advantage of the social and economic potential of those exports. To address this situation, ECLAC has highlighted the need for a new natural resource governance model (ECLAC, 2016) that would allow productive transformation by investing part of the income derived from natural resource exploitation in economic infrastructure in order to stimulate the economy. At the same time, the existing infrastructure and the quality of the infrastructure services (including transport and logistics) available for natural resources must also be strengthened. This is because the current infrastructure offers inadequate levels of quantity and quality and often prevents the creation of production chains or re-exports with added value because, as will be discussed below, it was designed for an enclave model.

Moreover, if the objective is to ensure that natural resource exports are equipped with a high knowledge content or added value, then a much more profound change in the way in which infrastructure is designed, regulates and operates is required. This is because public and private infrastructure alike do not encourage greater improvements in connectivity with the territory, which often prevents the entry of new productive actors and curtails not only the economies of scale and agglomeration and the network effects that could be attained in natural resource logistics, but also other positive impacts for the rest of the economy and for the process of sustainable development itself.³

³ The project “Logistics integration for a more sustainable exploitation of natural resources in Latin America and the Caribbean” (ROA/292-9), currently being carried out by the Natural Resources and Infrastructure Division, seeks to build the capacity of Latin American and Caribbean governments for the design and implementation of transport and logistics infrastructure policies that promote the diversified and sustainable exploitation of natural resources. Some of the project’s recommendations have been considered in this document.

III. The enclave policy and its impact on the development of a disconnected infrastructure

In many parts of the region, productive enclaves remain the dominant model for natural resource exploitation. This is a legacy of colonial times that was subsequently consolidated during the nineteenth century (Serje, 2011). In Latin America and the Caribbean, as in other regions of the world, enclaves were imposed through a system whereby companies were awarded “concessions” to facilitate the intensive extraction of natural resources in peripheral countries and regions. In those enclaves, companies (especially foreign ones) occupied the territory as independent powers, developing the infrastructure needed for their growth and the stability of the urban-commercial system through such necessary methods of penetration as ports, pipelines and military bases. Since they were geared towards the export of a single natural resource, these productive enclaves developed a mono-user/mono-product infrastructure. This significantly restricted the potential for diversification or the creation of new productive activities, as the only possible linkages were between the extractive activity and the services that local enterprises could provide.

The enclave concept is therefore essential in understanding the design of the region’s infrastructure for natural resources, in the same way that the concepts of “centre” and “periphery” are useful for understanding the political process behind it. The periphery is, by definition, frontier land of essential strategic importance, on account of both the resources it possesses and its key role in the reproduction of the prevailing economic order. For that reason, peripheral areas that are generously endowed with natural resources become dependent on an unequal relationship with the centre, and the political and economic impact of this moulds the political economy of those regions (Bridge, 2006, in Le Billon, 2008). As the relative economic and political importance of resource-producing areas increases, other areas become peripheries, in a process of peripheralization that occurs on a global scale between regions and countries and, at the local level, into the interior of a State’s territory. In resource-producing areas, other issues not related to resources are also peripheralized, which has effects that extend beyond the extractive sector itself to impact social identities, territoriality, governance, economic marginalization and the environment (Le Billon, 2008).

Ultimately, exploitation through productive enclaves has not led to the levels of development that were expected in the economies of resource-rich developing countries. The characteristics of the model prevent a path of sustainable development, since its organizational

structure hinders the establishment of linkages with the local productive fabric and forces the economy to depend entirely on extracting the natural resource, in isolation from the rest of the economy (García Alonso, 2017). This exacerbates social gaps and prevents a more harmonious form of development, and it often worsens conflicts over the large-scale resources that are available (Collier and Hoeffler, 1998).

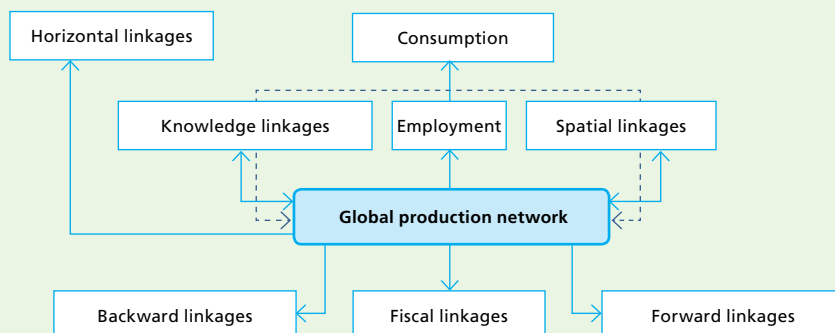
IV. Linkages and production chains associated with natural resources for structural change

The ultimate goal of natural resource exploitation is for its benefits to fuel intergenerationally equitable social and economic development. To that end, the governance of both the natural resources and the associated infrastructure must take account of a number of elements that favour the desired structural change. Thus, States have explored a range of tools that seek to generate production chains and forward, backward, horizontal and spatial linkages that can, first, create comparative advantages connected in the long term to the domestic economy and, second, mitigate the country’s growing dependence on the exploitation of natural resources and thus progress towards productive diversification, as shown in diagram 3.

Consensus exists regarding the key role played by national policy (and, when applicable, local policies) in establishing and maintaining linkages with the extractive sector. As those linkages are determined by the country context, the type of resource extracted, the method of exploitation, the incentives that exist and the ownership structure within the extractive sector, the capacity of those policies depends on the context and prevailing form of governance. For example, on account of their short exploitation cycle, precious metals are less conducive to the generation of backward linkages than other types of natural resources.

A State’s ability to generate backward linkages depends on the capacities of local suppliers, on the capacity of national institutions to support technological development and local suppliers’ access to credit and on the infrastructure and logistics services that will enable them to provide services in the quantity, quality and time required. Likewise, backward linkages create significant levels of indirect employment in such sectors as catering, laundry, clothing, uniforms, agriculture, financial services and administrative support, which predominantly employ women. However, successfully achieving such links is difficult because of their high dependence on the extractive activity, which generally demands services with low levels of innovation and added value; as a result, once the extractive work is finished, those linkages tend to disappear if they have not been incorporated into other, more complex chains.

Diagram 3
Linkages with the extractive sector



Source: Prepared by the authors, on the basis of CCSI, 2016.

The creation of forward linkages is, in turn, largely determined by the type of natural resource and the governance model. Industries that are created through such linkages develop capacities in new areas and thus have the potential for a positive impact on GDP, the trade balance and the State's earnings from natural resource exports. Nevertheless, the price volatility of products from these new industries tends to be lower than that of unprocessed resources. Accordingly, the development of tax incentives and investments in infrastructure are among the most important determining factors.

As a result, despite the importance of backward linkages—mainly in social terms and for capacity-building—the region's countries have placed greater emphasis on forward linkages, in order to progress through the nodes of global production networks and thus secure higher added value, create jobs and diversify their economies (CCSI, 2016).⁴ Such interventions and policies operate primarily at the national level and chiefly focus on smelting in the mining sector and on refining in the hydrocarbon sector; they also use other complementary mechanisms, such as taxation and export restrictions, to encourage resource processing at more advanced stages in the network. In spite of that, both smelting and refining remain largely concentrated in developed countries, which as a result enjoy the greatest potential for generating both backward and forward productive linkages. Thus, for example, over the last twenty years, the general trend in Chile has been for refined copper to account for a decreasing share of total copper output. In 2014, only 11.9% of Chilean copper was refined domestically and the rest was processed by foreign refineries, with those of China, one of the main purchasers of the resource, playing a particularly important part (Correa Mautz, 2016).

While not underestimating the broad benefits of these linkages and their potential contribution to GDP, installing such industries in developing countries that do not possess a market size commensurate with the investment required remains problematic: such linkages are capital- and energy-intensive, they demand highly skilled human resources and services for innovation and development, and they also require levels of economic and social infrastructure that can enable them to be globally competitive.

Horizontal or lateral linkages, in turn, are related to the development of new industries using the potential of the extractive sector's supply chain. Such linkages play a key role in economic diversification and in reducing dependence on the sector. While forward and backward linkages are more adversely affected by declining commodity prices or the conclusion of an extractive project, these horizontal industries can be more immune to such uncertainties because they are not engaged in other markets. Such linkages therefore allow a sector's knowledge and capacities to be adapted to other sectors. This is illustrated by the experience of Finland, where the Government played a key role in the country's development by placing a high priority on tertiary education, knowledge, investment in research and development (R&D) and industrial policy for the future.

In particular, spatial or infrastructure linkages relate to the benefits arising from the development of infrastructure that is initially introduced for an extractive project but that gradually extends into other sectors of the economy. Thus, for example, designing infrastructure that meets the demands of extractive sectors while also allowing access to it by other sectors that may outlive the exploitation of the natural resource not only leverages economic development, especially in countries with large infrastructure gaps, but also provides an opportunity to do work that is socially and environmentally more

⁴ In the case of Africa, the creation of greater added value and forward linkages is a policy objective of the African Mining Vision (African Union, 2009).



cost-effective or that can better integrate the territory. This can be achieved by investing tax revenues in long-term infrastructure assets and by requiring the shared use of or open access to the infrastructure developed for exploitation through public-private partnerships, where the State acts as the guarantor of free access to the infrastructure and regulates non-discriminatory competition among nascent sectors. As noted by CCSI (2016), not all commodities offer equal opportunities for shared infrastructure use or open access to it, because every resource has different infrastructure requirements. However, a design that takes those considerations on board at an early stage can facilitate the leveraging of resources and allow the design and integration of logistics infrastructures that increase the sustainability with which those natural resources are exploited.

Above and beyond the qualitative issues, economic chains and linkages must be seen as an opportunity for beneficial regional transfers of technology. Over recent decades, and as a result of technological progress, there has been a pronounced shift in favour of capital at the expense of labour, which has led to increased inequality in income distribution within natural resource chains and, consequently, in many developing countries (Dicken, 2011). In that regard, the cited author distinguishes between dependent and development linkages, as the value secured along the network is primarily due to the configuration of power in the network, which tends to be

In a first attempt to break that dichotomy, the concept of “glocal” has therefore been proposed (Swyngedouw, 1997). This notion underscores the intersection between two highly porous scales, analysing the localization of the global and the globalization of the local and understanding that each country, region and city is largely built through relations of interdependence that link it to other places, where neither of the two scales is isolated from the other. Further to the preceding sections, good governance —whether of natural resources or infrastructure— must be multiscalar, as a way to pay due attention to the phenomena and dynamics that arise in the different stages and territories that the natural resource logistics chain crosses from the point of origin to the final consumer. This is because both logistics and the extraction of natural resources deeply affect the natural, political, cultural and institutional environment at the local level and must therefore abide by certain local and national regulations. However, those markets are also highly internationalized in commercial terms, so that companies are simultaneously very local and very global, and their competitiveness lies therefore in the proper interaction between the scales and between the human and non-human actors and intermediaries (such as infrastructure and logistics) in global production networks (Dicken and others, 2011).

Hence the importance of the State persists on account of its role as the territorial institution that ensures policy development, the regulation of markets and property, security, and other factors without which the system would collapse (Swyngedouw, 2004). In many countries of Latin America, the State is also the owner of the natural resources found in the ground and the subsoil, as well as an important player in regulating and negotiating cultural, social, economic and territorial matters. All these elements explain why the State has been at the centre of the tensions and conflicts that have

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