Documento de Trabajo

Going green through local fiscal equalisation

JULIO LÓPEZ-LABORDA
ANDONI MONTES-NEBREDA
JORGE ONRUBIA

Documento de Trabajo 2023/07
Octubre de 2023

fedea

Going green through local fiscal equalisation

Julio López-Laborda
Universidad de Zaragoza & Fedea

Andoni Montes-Nebreda
Ituna Center (UPV/EHU) & ICEI-UCM

Jorge Onrubia
Complutense Institute of International Studies (ICEI-UCM) & Fedea

September, 2023

Abstract

Success of centrally set environmental objectives requires the engagement of subnational governments. However, they often do not have the capacities or the incentives to apply ambitious climate mitigation and adaptation policies. Indeed, stricter environmental policies can lead to a decrease in local revenue collection as a consequence of the reduced activity resulting from the correction of externalities. To address this issue, in the line of Ecological Fiscal Transfers, we propose the inclusion of incentives linked to environmental objectives in local equalisation that would compensate for the opportunity costs faced by municipalities. In particular, we suggest greening fiscal equalisation by including a multidimensional index of local environmental performance that could be complemented by a green expenditure needs component as criteria for the allocation of equalisation grants. To illustrate how this proposal would work, we examine the financial effect that environmental fiscal equalisation would have had across Basque municipalities for the 2016-2019 period. As a main result, we find that less sustainable cities could lose up to the 5% of their per capita transfers, while small and most sustainable municipalities could win up to 13% of their per capita allocations.

Keywords: fiscal equalisation, environmental policy, green transition, local public finances, fiscal federalism.

JEL Codes: H23, H7, H71, H77, Q53, R51.

Acknowledgements: The authors acknowledge the Foral Government of Bizkaia for providing useful data for this research and Ángel de la Fuente for his comments and thorough review of the paper. Julio López-Laborda acknowledges funding from the Government of Aragón, through research project S23_23R.

Resumen ejecutivo

La transición ecológica ha ido escalando lugares en la agenda pública durante los últimos años, hasta situarse como una de las principales prioridades para ciudadanos e instituciones. Debido a la sólida evidencia científica y a la cada vez más frecuente sucesión de fenómenos climáticos extremos, los responsables públicos han adquirido compromisos más ambiciosos para frenar el calentamiento global en particular, y el deterioro del medio ambiente en general. El Acuerdo de París, el Pacto Verde Europeo o la Agenda 2030 y sus Objetivos de Desarrollo Sostenible (ODS) son buenos ejemplos de ello. La mayor parte de estos objetivos han sido consensuados a nivel internacional (y supranacional, en el caso de la Unión Europea). Sin embargo, buena parte de la responsabilidad competencial sobre las políticas necesarias para cumplir con esos compromisos reside en los gobiernos regionales y locales. Así, materias como el urbanismo y los usos del suelo, la movilidad o la gestión de residuos, claves para la transición ecológica, tienen un componente preeminentemente subnacional.

Esta dicotomía entre qué nivel de gobierno adquiere los compromisos ambientales y cuál debe ser el responsable de ejecutar después las políticas concretas es algo natural e innato a los sistemas de gobernanza descentralizada. Sin embargo, si los gobiernos regionales y locales carecen de medios para contribuir con su acción al cumplimiento de los objetivos ambientales, o si las agendas políticas de los distintos niveles gobierno están desalineadas, puede ponerse en riesgo el éxito de la agenda verde.

Los datos más recientes provistos por la OCDE y el Comité de las Regiones de la Unión Europea apuntan a que el progreso en el cumplimiento de los ODS ambientales no avanza al ritmo que cabría esperar. Entre las causas, se identifica, por un lado, que los gobiernos subcentrales, y particularmente los ayuntamientos más pequeños, carecen de medios humanos y económicos suficientes para diseñar e implementar las políticas ambientales con la ambición y celeridad necesarias. Por otro lado, buena parte del conjunto de medidas ambientales afecta de forma negativa a la capacidad fiscal local, en la que el Impuesto de Bienes Inmuebles ocupa el primer lugar por volumen de recaudación. Por ello, los ayuntamientos podrían tener incentivos para no aplicar las políticas ambientales necesarias, con el objetivo de preservar su capacidad de recaudación fiscal, al menos en el medio plazo.

Este Documento de Trabajo discute la posible utilización de los sistemas de financiación, en este caso local, como herramienta para tratar este problema. En concreto, sugerimos vincular los fondos de nivelación fiscal transferidos a los ayuntamientos a los resultados ambientales logrados por estos y a su mejora. De esta forma, los municipios más sostenibles o que muestren mayores mejoras en materia medioambiental recibirían más fondos, con el objetivo de compensar las potenciales pérdidas de recaudación que las políticas verdes pudieran generar en sus presupuestos. Esta propuesta bebe de la experiencia de las Transferencias Fiscales Ecológicas (conocidas como *Ecological Fiscal Transfers,* en inglés), nacidas en el estado brasileño de Paraná en el año 1991, y hoy extendidas a países como Francia, Portugal, China o India, donde la fórmula de reparto considera variables como el porcentaje de suelo ocupado por bosques o parques naturales, o la calidad del aire y del agua. A pesar de estar cada vez más extendidas, las Transferencias Fiscales Ecológicas aún no se han implementado en España.

Debido a la disponibilidad de datos, este Documento de Trabajo aplica la propuesta, como ilustración, a los sistemas de financiación local de Euskadi, aunque su lógica es igualmente válida para el Sistema de Financiación Autonómica o Local de régimen común. De implementarse, siguiendo el ejemplo portugués, el 5% de las trasferencias recibidas por los ayuntamientos pasarían a distribuirse según un Índice de Sostenibilidad Local (*LSI*, por sus siglas en inglés) que construimos con variables en los ámbitos relacionados con el medioambiente como agua, calidad del aire, energía, transporte y movilidad, presión turística, uso del suelo, y residuos, para el periodo 2016-2019. Según nuestros cálculos, los municipios más sostenibles podrían ver incrementadas sus trasferencias hasta en un 13%, mientras que aquellos con un peor desempeño podrían perder hasta el 5% de su asignación actual.

Finalmente, se introduce la posibilidad de extender el LSI más allá de la compensación del coste de oportunidad de la capacidad fiscal, vinculado a la mitigación climática, para nivelar además las necesidades de adaptación, más ligadas a la nivelación de necesidades de gasto, como el riesgo de sufrir inundaciones o los efectos de las sequías.

En términos generales, los resultados de este ejercicio sugieren que una reforma verde de la nivelación local podría ser positiva no solo para su eficiencia, sino también para la equidad entre municipios. Desde el punto de vista de la eficiencia, la internalización de las externalidades ambientales a través del sistema de nivelación, gracias al establecimiento de un esquema de incentivos más sostenible, generaría una mejora del bienestar social agregado. La reforma también supondría un avance desde la perspectiva de la equidad, al considerar de una forma más holística la capacidad fiscal y las necesidades de gasto relacionadas con el medio ambiente, hasta ahora ignoradas. Además, en el caso de Euskadi, obtenemos que la dispersión entre municipios de la distribución per cápita de las transferencias se vería reducida. Es decir, la desigualdad en el volumen de fondos por habitante recibidos por cada ayuntamiento disminuiría, beneficiando a las ciudades intermedias, más sostenibles que las grandes capitales y los municipios más pequeños.

1. Introduction

Ecological transition is one of the challenges policymakers are trying to address within the United Nations´ Sustainable Development Goals (SDG) agenda. The pre-pandemic momentum of increased environmental awareness facilitated international agreement on more stringent green objectives. The signature of the Paris Agreement, or the launching of the European Green Deal, are important examples of this trend.

Climate change is a global problem to be tackled by measures at the global level. However, other environmental issues, such as natural landscape, biodiversity and ecosystem protection, energy consumption, water quality, waste production and management, or air quality, have a pre-eminently local scale. Although most objectives in these areas are set at the international or national levels, following a top-down approach, responsibility for the design and implementation of the policies required to attain them is shared across several levels of government or falls on cities (OECD, 2020).

Therefore, success in achieving environmental goals requires local governments´ engagement with the green agenda. Current results, however, are not promising, as only a few municipalities have implemented comprehensive plans for ecological transition. In fact, central mandates for compulsory plans, political willingness, and city size are the main drivers for their existence (Tang et al., 2010; Reckien et al., 2018). This can be explained both by the incentive scheme that guides local governments´ policymaking and their limited capacities, particularly in the case of smaller municipalities. Following the political economy approach adopted by the Second-Generation Theory of Fiscal Federalism, local governments´ objective function can be assumed to depend on the size of their budget (Niskanen, 1971) and the welfare of residents within their jurisdiction (Oates, 2005). In this framework, municipalities may refrain from taking more ambitious and decided environmental protection measures in order to protect their budgetary capacity, since local tax bases (e.g. real estate or car ownership) could be negatively affected by environmental protection policies (Ring, 2008b; Busch, 2021) which may hinder economic activity (Azzoni and Isai, 1994; Ferraro, 2002; Adams et al., 2010; Karsenty et al., 2014; Nikitina, 2019; Canan and Ceyhan, 2020). The loss of tax revenue resulting from the reduction in activity associated with the correction of externalities can be interpreted as the opportunity cost that local governments face when implementing effective environmental policies.

Following the rationale for households' income compensations suggested by the political economy literature (Clinch et al., 2006; Caratini et al., 2019) to gather popular support for the ecological transition, which is at the core of the European Green Deal (Montes and Moreno, 2022), some countries have created conditional intergovernmental grant frameworks for subnational governments, which are allocated on the basis of a diverse range of environmental variables. They are the so called Ecological Fiscal Transfers (EFT). Although they are still uncommon, their use is on the rise, having been already adopted in Indonesia (Mumbunan et al., 2012; Ardiansyah and Jotzo, 2013), Portugal (Santos et al., 2012), India, France, China (Busch et al., 2021), and some Brazilian states (Ring, 2008a; May et al., 2013; Droste et al., 2017) and German regions (Ring, 2008b). However, most experiences in this line have been of limited scale and have been implemented as *ad hoc* earmarked grant schemes, rather than as part of comprehensive fiscal equalisation schemes. Consequently, large-scale and systematic linkages between budget and environmental goals have not yet been introduced (Busch et al., 2021; Smoke and Cook, 2022).

Most schemes compensate municipalities for increased expenditure needs related to the establishment and management of local protected areas, for the interjurisdictional positive spillovers generated by so called "ecosystem services" (Ring, 2008b; Loft et al., 2014), or for the opportunity cost on revenue losses caused by the implementation of more severe environmental protection policies (Busch et al., 2021). This paper proposes fiscal equalisation as an appropriate tool to scale-up the path opened by EFTs, and to set more adequate incentives for local municipalities to better align their policies with international and national ecological agendas. First, we propose using the fiscal capacity component of fiscal equalisation as the instrument to support mitigation, thus compensating municipalities for the negative impact (opportunity cost) local environmental policies could generate in their own tax revenue. In addition, we suggest complementing the above component with an indicator of increased expenditure needs related to climate change adaptation, based on risks linked to extreme climate events. In order to illustrate the proposal, we make use of the rich variety of environmental variables integrated in a database for 251 Basque municipalities to build and apply a synthetic multidimensional green indicator. Then, we examine the budgetary impact of the proposed environmental fiscal equalisation reform. We find that less sustainable cities could lose up to 5% of their per capita transfers, while small and more sustainable municipalities could increase their per capita allocations by up to 13%.

The paper is structured as follows. Section 2 gives context on the green local agenda. Section 3 introduces Ecological Fiscal Transfers and discusses the pros and cons of introducing environmental components into fiscal equalisation schemes. Section 4 provides a thorough justification of our proposal of introducing an environmental component into local equalisation systems, both from the side of fiscal capacity (mitigation) and expenditure needs (adaptation). The following sections are devoted to developing the proposal and applying it to the Basque local equalisation system, for which sufficient information is available. To this aim, Section 5 briefly describes the Basque local funding system. Section 6 explains the methodology used to build a synthetic multidimensional green indicator (the Local Sustainability Index), presents some descriptive statistics, and estimates the impact the reform proposal would have had on Basque municipalities´ funding during the 2016-2019 period. In Section 7, results are assessed together with the budgetary effects of this environmental fiscal equalisation proposal in terms of winners and losers. Finally, Section 8 concludes, gathering some policy recommendations and suggestions for further research.

2. The green local agenda

The global scope of Climate Change has led to the adoption of international agreements to reduce Greenhouse Effect Gas Emissions (GHG) to contain global warming to 1.5º C degrees by the end of the XXI century, as in the Paris Agreement. At the supranational level, European Union member states have committed to reach ambitious reductions of GHG for 2030 and to be net carbon neutral in 2050. Due to the large geographical externalities of climate mitigation policies, the scope of most important measures to pursue these targets, such as green investments on environmental infrastructure or innovation, are being designed and implemented far from subnational governments (SNGs) (Martinez-Vazquez, 2021).

However, the environmental agenda is not limited to climate change, and in fact involves a full range of other environmental challenges. Among them, are those relating to natural landscape, biodiversity and ecosystem protection, energy consumption, resources, water, waste production and management, or air quality. In contrast to global warming, these problems are

more localized, as shown by Table 1. Consequently, attaining ecological transition commitments will require the engagement of local governments. In fact, according to the OECD (2020), at least 105 of the 169 SDGs targets will not be attained without subnational governments´ involvement.

Table 1. Environmental policy responsibility attribution across levels of government

Policy area	Target-setting	Design	Implementation	Funding
Climate change (decarbonization)	International, supranational, national	National	National	Supranational, national
Energy saving (consumption)	Supranational, national	National	Regional, local	National, regional
Land use, resources, biodiversity and ecosystem protection	Supranational, national	National	Regional, local	National, regional, local
Water	Supranational, national	National, regional	Local	National, regional, local
Waste management	Supranational, national	National, regional	Local	Local
Air quality	Supranational, national	National	Local	Local

Source: own elaboration, based on De Mello and Ter-Minassian (2023) and Dougherty and Montes-Nebreda (2023).

Local involvement on the green agenda could just mean coordination and harmonisation of practices. However, in those policy areas in which subnational governments have shared or exclusive responsibility to design and implement policies, their incentives and capacity to pursue targets, which are often designed in a top-down basis, are even more relevant. Indeed, according to OECD (2020) data, SNGs are responsible for almost 60% of total public investment, including investment related to ecological transition, and for around 40% of public expenditure executed at the OECD.

An example of the top-down approach is the mandate set by the Spanish Climate Change Law (art. 14.3.a) for cities of more than 50,000 inhabitants, and smaller ones (>20,000 inhabitants) with bad air quality statistics, to implement Low Emission Zones (LEZ) by 2023. For that purpose, municipalities will receive 2,916 million euros in support from European Union´s Next Generation Funds, as stated by the Spanish Recovery, Transformation and Resilience Plan (Spanish Government, 2020). In addition, the Central Government´s guidelines for LZEs implementation, encourages municipalities to introduce congestion charges as a complementary policy (MITECO, 2021).

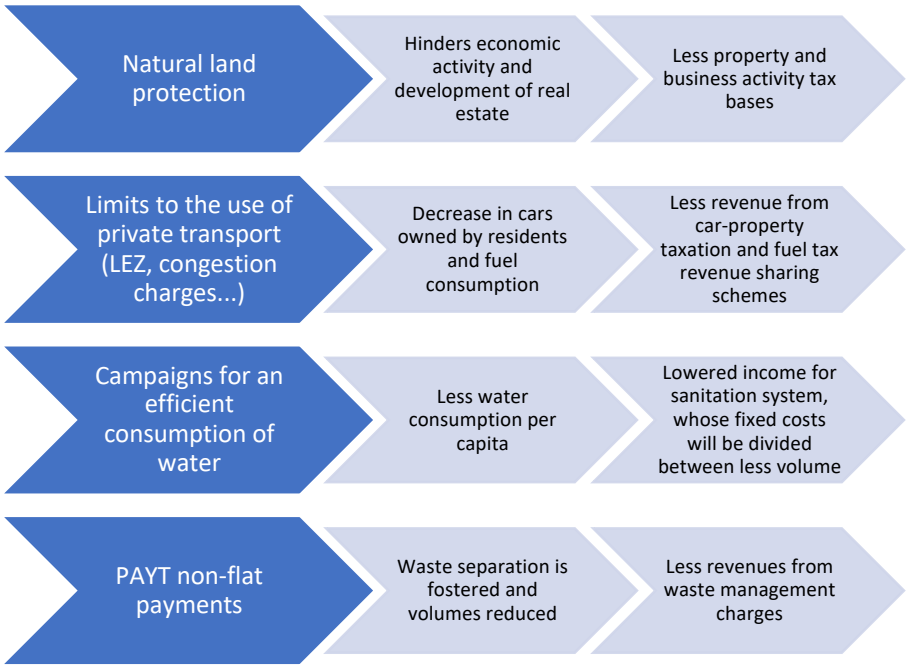
However, despite the importance of subnational governments´ role on attaining environmental targets, figures for regions and cities´ compliance with SDGs show there is still work to do. For instance, in 2019 only 20% of OECD regions had achieved 2030 targets on responsible consumption (SDG12), no region had achieved 2030 objectives on climate action (SDG13), and 70% of cities had not achieved any of the 17 SDGs targets for 2030. These figures are even more worrying when realising that environment-related SDGs are reportedly the top priority for 73% of SNGs, according to OECD-CoR survey data (OECD, 2020).

There are two main channels that explain why, although SNGs are sensitive and committed to environmental issues, this is not translated into outcomes. The first one has to do with the lack of incentives. Currently, local policy agendas are not guided by an incentive scheme that rewards environmental action. Consequently, there is an agenda misalignment across levels of government. The second-Generation Theory of Fiscal Federalism has extensively addressed this phenomenon by making use of public choice theory and political economy to explain policymakers' behaviour and analyse its determinants (Oates, 2005). The literature has conceptualised this situation as a principal-agent problem (Schick, 1998), where, in contrast to central government´s, the utility maximisation formula followed by local policymakers only accounts for local interest, and only for the short term, as in the long-term environmental policies will deliver local wellbeing too (EEA, 2007; Stern, 2007).

For local governments, there is an opportunity cost of protecting the environment (Azzoni and Isai, 1994; Ferraro, 2002; Adams et al., 2010; Karsenty et al., 2014; Nikitina, 2019; Canan and Ceyhan, 2020) in terms of foregone tax revenue (Ring, 2008b; Busch, 2021). The most straightforward case is the impact of sustainable land use policy on local property taxes. Devoting a larger share of the land of a municipality to protected natural spaces, excludes the possibility of using them for residential, industrial or other business-related activities, and thus, it is likely that less property tax will be raised. This is probably the most sizeable channel among those represented in Figure 1, since property taxes represents the largest own-revenue source for cities across the OECD (OECD, 2021). In fact, this is the reason why the most common variable to allocate EFTs is the share of protected natural areas (Busch et al., 2021). In short, as mentioned above, the loss of tax revenue resulting from the reduction in activity associated with the correction of externalities can be interpreted as the opportunity cost of implementing effective environmental policies.

The second channel through which local governments´ awareness is not translated into policy action is the limited administrative capacity (Tang et al., 2010; Reckien et al., 2018; OECD, 2023). Particularly smaller municipalities do not have enough means (human, funding, know-how) to carry out their most elemental duties, such as water provision or urban waste management, so they usually need to delegate into supramunicipal entities. When tasks are even more complex, such as designing, implementing, monitoring and evaluating effective measures to contribute to the green agenda promoted by higher levels of government, then more problems arise. Both the former and latter channels could be addressed by compensations through environmental fiscal equalisation schemes.

Figure 1. The opportunity cost of local environmental protection policies for local budgets



Note: PAYT stands for Pay as You Throw waste collection systems.
Source: own elaboration.

3. Ecological fiscal transfers

Due to the increasing salience environmental policy has gained during the last decades, scholars in Federalism have investigated the interactions between that topic and multilevel governance. The outcome is a line of research known as "Environmental Federalism" (Anderson and Hill, 1996; Harrison, 1996; Schberle, 1997). If we focus on the public finance aspect of federalism, some literature has become interested in the correlation between decentralisation levels and environmental policy ambition (Kunce and Shogren, 2008; Ardiansyah and Jotzo, 2013) and its results (Liu et al., 2017; He et al., 2017; Guo et al., 2020; Huang et Zhou, 2020).

However, if we follow the so-called Theory of Fiscal Federalism (Oates, 1972, 1999; Musgrave, 1983), then the main question posed by the previous literature has to do with possible ways in which intergovernmental fiscal relation instruments, particularly transfers, could help address environmental deterioration by supporting environmental protection policies (Ring, 2002, 2008a, 2008b; Mumbunan et al., 2012; Santos et al., 2012; Irawan and Tacconi, 2016; Busch et al., 2021). In our view, this is the key question to address in order to cope with the principal-agent problem of environmental agenda misalignment across levels of government explained in the previous section.

There are several forms to incorporate the environmental perspective in transfer allocation formulas. We will follow the classification criteria laid out by Ring (2002), according to which we could depict indirect or direct implementation of environmental variables. On the one hand, the former would use land extension or population density as proxies to internalise the positive spillovers ecosystem services provide to other jurisdictions and to the country as a whole. While these variables are often incorporated into grant allocation formulas, their actual link to

environmental goals is rather loose. On the other hand, there are at least three more direct ways to incorporate the environmental criteria:

- Earmarking certain share of funds devoted to vertical transfers to ecological and environmental services before any indicator come into play (Ewers et al., 1997; Rose, 1999).
- Including ecological functions as bases for calculating fiscal needs relevant for horizontal allocation (across jurisdiction) (e.g. to compensate regions for environmental damages, such as those caused by mining) (Busch et al., 2021).
- Earmarking a certain share of grants for environmental projects (e.g. waste disposal or water supply). For instance, this is the scope adopted by Next Generation EU funds, since a third of its total amount has to be spent in projects whose aim is to fight climate change. A similar approach has been used by some German lander to allocate funds to municipalities (Ring, 2001, 2002).

Regarding direct policies, a rich literature has been developed, which coined the concept of "Ecological Fiscal Transfers" (EFTs). This particular class of transfers are allocated according to environmental variables in order to compensate subnational governments for implementing environmental protection policies (expenditure needs), for the positive spillovers generated by them - following Olson´s (1969) fiscal equivalence theory- (Ring, 2008b; Loft et al., 2014), and for the opportunity cost (Azzoni and Isai, 1994; Ferraro, 2002; Adams et al., 2010; Karsenty et al., 2014; Nikitina, 2019; Canan and Ceyhan, 2020) represented by revenue they could have raised if, for example, certain land areas would have been assigned to productive economic activities instead (fiscal capacity) (Ring, 2008b; Busch et al., 2021).

Some policy experiences implementing EFTs have been recorded already. The first experience emerged as a response to compensate for opportunity costs in the form of foregone revenues and took place in the Brazilian state of Parana in 1991 (Campos, 2000; May et al., 2012, 2013*;* Ring, 2008a). For 2020, 18 out of 27 states had adopted similar transfer programmes for municipalities. In the state of Acre, the share of transfers allocated according to environmental criteria reaches a high 20%. Other countries, such as Mongolia and Uganda, have recently introduced EFTs for expenditure needs and externality compensation, respectively, and in Australia, Poland, Switzerland or Ukraine proposals have been made (Busch et al., 2021). For its part, Droste et al. (2018a, 2019) suggested EU and international-level EFT implementation for spillover compensation.

Percentage or changes in natural protected area coverage is the predominant EFT allocation criteria. Also, most EFTs are earmarked grants, meaning that money received must be devoted to local natural conservation policies. Oppositely (and exceptionally), this is not the case in France, Portugal, and in some EFT programmes in India and Indonesia, where their EFTs are general-purpose grants (Busch et al., 2021).

However, there is no consensus on whether EFTs have achieved their goal. Droste et al. (2017) evaluated the Brazilian scheme and concluded that it increased the share of protected natural areas. For its part, Loureiro (2002) limited this positive direct effect to the first decade of the programme, suggesting there was a saturation effect. In contrast, May et al. (2012) found the opposite, and reported that in 10 out of the 13 Brazilian states analysed, the average number of new protected areas declined in absolute terms after the EFT scheme was introduced. Finally, in China, as reported by Busch et al. (2021), and contrary to Gong et al. (2020) and Yan and Honghua (2020), it was found that environmental quality improved in some provinces. Still, the

cross-province analysis for the whole China has shown mixed results, with reduced pollution (Cao et al., 2021; Chen et al., 2023) and improved water quality -mediated by local spending on environmental protection-, but no increases in natural land cover (Miao and Zhao, 2019).

3.1. Environmental fiscal equalisation

The main goal of equalisation schemes is to enable SNGs to cover their expenditure needs given their fiscal capacity. Fiscal capacity can be defined as the revenue that a SNG can obtain for a given fiscal effort. Expenditure needs can be defined as the amount of public expenditure a jurisdiction has to devote in order to provide a minimum/sufficient/average level of public services. Best practices suggest that potential variables and outcome measures should be used when possible in equalisation schemes (Boadway and Shah, 2007) in order to minimise the room for SNGs (and for the Central Government; Onrubia, 2016) to manipulate the formula in order to attract more transfers (Courchene and Beavis, 1973; Petchey and Levtchenkova, 2002 and 2004; Ferede, 2014).

Fiscal equalisation transfers have rarely been used to skew SNGs´ agendas towards greener policies. France and Portugal are the only countries that have integrated EFTs in equalisation schemes. In these countries, green variables are not isolated but are mixed with the rest of variables, such as population or geographical data, used to allocate general purpose grants and represent a proxy for lowered fiscal capacity. In the case of the former, EFTs represent 15% of equalisation transfers paid to local governments. Nevertheless, the environmental component (natural protected areas) of the formula is used to determine the allocation of just a negligible 0.02% of total transfers received by French municipalities (Borie et al., 2014; Busch et al., 2021). This only slightly changed in 2019, when the programme increased its coverage by softening requirements to qualify for allocations. In the case of Portugal, the weight of EFTs is more relevant, reaching 5% of the General Municipal Fund, and the allocation variable is the percentage of land under nature protection (Santos et al. 2012; Busch et al., 2021). Droste et al. (2018b) found that Portuguese EFT had a positive impact on local-level protected areas, suggesting that the goal pursued by the policy was achieved.

There are several advantages to implementing intergovernmental incentives through fiscal equalisation in comparison to previously surveyed EFTs. First, they better respect the principle of subsidiarity and local self-government since they do not earmark grants to a specific expenditure function, which is particularly contraindicated in institutional frameworks with high quality of government. In fact, efficiency gains from better information, from policies tailored to local preferences and needs, and from increased accountability require expenditure autonomy (Oates, 1972). Second, grant earmarking is often accompanied by matching requirements (co-funding), which entails the risk of a lower take-up, as it is the case for regional policy funds or investment funding supported by EU grants (European Court of Auditors, 2020). Third, as argued by Cao et al. (2021), EFTs may help to stop the race to the bottom in environmental standards. Precisely, preventing policy competition across jurisdictions is one of the main effects identified for fiscal equalisation (Köthenbürger, 2002).

Fourth, *ad hoc* transfer schemes entail a higher risk of discretionality, in contrast with more transparent, stable, and predictable formula-based fiscal equalisation arrangements (OECD, 2021). In this line, it is recommended to use different fiscal tools for different goals, following the “one tool, one goal” rationale to avoid the risk of using an instrument to pursue contradictory goals or that due to multiple aims, none is achieved. Therefore, since the aim of environmental transfers is to compensate for increased expenditure needs (e.g forest

conservation, adaptation to extreme climate events) or decreased fiscal capacity (e.g. opportunity cost of natural land use and protection, or climate mitigation), and this is the same objective of fiscal equalisation, it is then recommended to use the latter instrument rather than *ad hoc* schemes. In addition, EFTs are often of smaller size than fiscal equalisation frameworks, thus being able to generate more modest behavioural changes on SNGs. And finally, from a political economy perspective, reforming an already existing fiscal instrument is more feasible than creating a new one (Santos et al., 2012). Therefore, amending current fiscal equalisation frameworks would provide environmental incentives with more stability and would make it easier for them to spread across institutional frameworks.

On the contrary, there is one main argument against the inclusion of green components within fiscal equalisation formulas: unconditionality. By definition, fiscal equalisation transfers are unconditioned. Consequently, there is no guarantee that they will be spent on environmental protection policies, which could have a "double dividend" effect (Goulder, 1995). This is the main reason why, traditionally, earmarked EFTs have been more frequently used. It is true that this argument would affect the climate-adaptation expenditure needs component proposed as complementary in this paper. However, the aim of the proposed green fiscal capacity component of fiscal equalisation schemes, which is the core of this article, is not to support expenditure in environmental protection, but to compensate for the loss in tax bases suffered as a consequence, to avoid disincentives for local governments to commit to the green agenda set by higher levels of government.

4. A proposal for greening local fiscal equalisation

4.1. Fiscal capacity equalisation and climate mitigation policies

In both the French and Portuguese models, environmental fiscal equalisation is carried out from the fiscal capacity side. In other words, municipalities with large shares of land covered by protected status receive more funds, and grants are also tied to other proxies for revenue loss. The main argument is compensating local governments for the opportunity cost of protecting the environment. This concept has been extensively used by the literature on Environmental Economics (Azzoni and Isai, 1994; Ferraro, 2002; Adams et al., 2010; Karsenty et al., 2014; Nikitina, 2019; Canan and Ceyhan, 2020). The opportunity cost equates to the economic cost of economic activity restrictions imposed by environmental protection policies. This utility loss for firms and households equals the amount of their surplus eliminated by the internalization of a negative externality through green policies. Lowered firms´ benefits and lower households´ income, and thus lowered fiscal bases within the jurisdiction, reduce its fiscal capacity (defined as the tax revenue raised applying standard effort).

Indeed, municipalities would be compensated for this loss through the environmental fiscal capacity component of an environmental equalisation system. And this is precisely the idea that justifies introducing the environmental component in SNGs' equalisation schemes.

In a very simplified form, the theoretical framework would be as follows. Assume two municipalities (M1, M2), identical in terms of capital and labour endowments (K1=K2; L1=L2), population (P1=P2) and per capita income/wealth (R=R1=R2). R represents, at the individual level, the result of short-term maximisation of private surpluses of firms and households. In the long run, due to negative environmental externalities, individual utility function maximising behaviours do not maximise social utility.

Under the assumption that the local tax base (B) is directly related to individual income or wealth, then the tax base of M1 is B1=P1·R1 and that of M2 is B2=P2·R2. Since both municipalities have identical characteristics, then B1=B2. If both jurisdictions design and implement a local tax system that requires the same tax effort (t=t1=t2) for taxpayers, the corresponding fiscal capacities would equate T1=t1·B1 and T2=t2·B2, and thus, T=T1=T2.

We assume that before public intervention, both municipalities have the same environmental problems. However, they implement measures that differ on size, design or implementation effectivity. Therefore, each jurisdiction´s intervention will lead to different opportunity costs, C1 and C2. Considering that M1´s intervention corrects negative environmental externalities to a larger extent than M2´s, then C1>C2.

Consequently, economic capacities become R-C1 and R-C2, and their tax bases, B1'=P1·(R-C1) and B2'=P2·(R-C2), with B1'<B2', and hence T1'<T2'. Due to the higher opportunity cost generated by M1´s environmental protection policy, an argument to compensate M1 through an adjustment in the fiscal capacity component of the fiscal equalisation formula emerges. The compensation amount (S) should be determined to restore the the equality B1´=B2´, and subsequently the identity T1'=T2', such that S=P·(C2-C1)·t. Otherwise, jurisdictions´ incentives to implement ambitious and thus costly environmental policies will be reduced.

4.2. Expenditure needs equalisation and climate adaptation policies

When climate policies are discussed, in addition to mitigation policies that aim to prevent the increase in temperatures, adaptation policies can also be considered. Adaptation policies try to help cities and infrastructures to remain resilient and liveable once temperature increases. While mitigation-oriented environmental policies, such as restrictions on the use of cars or land uses, generate an opportunity cost in terms of revenue losses, as discussed in the previous section, adaptation policies are linked to an increase in expenditure needs. Variables used by most EFT schemes, or the French and Portuguese green fiscal equalisation components, are related to mitigation and prevention, but have little to do with adaptation. However, there are strong arguments supporting consideration of environmental variables related to the expenditure needs component of fiscal equalisation formulas too.

In fact, protecting neighbourhoods from the rise in the level of the sea or rivers or creating cities liveable during longer and hotter summers, require large investments in the present. Although large climate adaptation infrastructure policies are usually carried out and funded by regional or central governments due to their magnitude, when these infrastructures are circumscribed to cities, it is local public budgets that have to support these projects. For instance, if a capital city would decide to reform its streets and urban design in order to alleviate the "Urban heat island effect" it would have to assume its costs. This is why an expenditure need component to support municipalities that have a greater need for climate adaptation could complement the fiscal capacity component previously introduced so both sides of fiscal equalisation would consider environmentally related variables when allocating transfers across municipalities.

As is the case when unemployment, poverty and inequality rates (i.e., variables which can be manipulated by governments) are used to compensate SNGs' increased expenditure needs in social assistance through fiscal equalisation, moral hazard problems could arise when municipalities are compensated for their vulnerability to extreme climate events or their higher need of adaptation to face the consequences of climate change. Periodic evaluation of progress in adaptation policies could be used to build indicators for related expenditure need equalisation that help address potential moral hazard issues. Yet, the cost of climate inaction is forecasted to

be so high (EEA, 2007; Stern, 2007) that receiving more transfers would never compensate damages produced due to insufficient adaptation. Furthermore, even if the impact of local environmental policies is of critical importance, isolated local climate action will not obviate the need for adaptation. Therefore, it seems fair to support more vulnerable municipalities.

In the following sections, inspired by international experiences and the discussion developed in the previous sections, we present our proposal to introduce an environmental component into the local equalisation scheme. We discuss the methodology used to build the Local Sustainability Index, a composite index that incorporates both the opportunity cost in terms of fiscal capacity (LSI) and the increase in expenditure needs (LSI+). First, we justify the use of the variables selected to construct the synthetic LSI. Second, we carry out the regressions (OLS-approach) and Principal Component Analysis (PCA) needed to calculate the value of the index for each municipality. Then, to illustrate the proposal, and due to the lack of data for the rest of Spanish municipalities, we apply the index to the current Basque local equalisation system and provide figures on how fiscal transfers received by Basque municipalities would have changed for the 2016-2019 period under our proposal. In the following section we describe in some detail the local funding systems in the Basque Country.

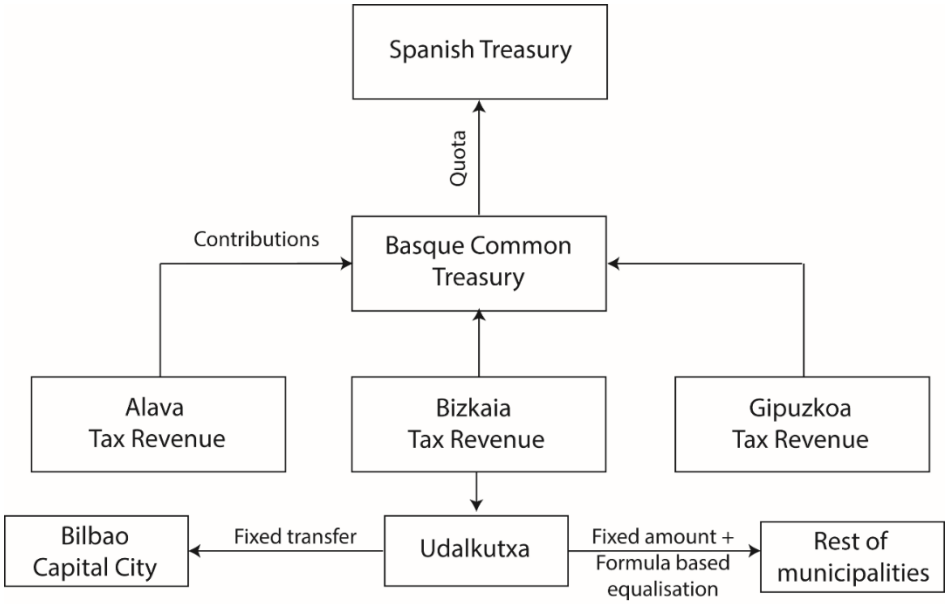
5. Basque Local Funding Systems

The public finances of institutions of this region of Spain are governed under a special funding regime called the "Economic Agreement". The agreement provides the Basque provinces (Alava, Bizkaia and Gipuzkoa) with a very high degree of tax autonomy, and with freedom to design their own formulas to support municipalities within each of the three jurisdictions. The Economic Agreement defines two types of intergovernmental fiscal relations, illustrated in Figure 2: external and internal. External relations refer to those between Basque institutions and Spanish institutions, such as the "Quota". Tax revenue collected by the three provincial treasuries is first used to fund the Quota paid by the Basque Regional Government to the Spanish Treasury for public services and goods provided by the Central Government. Internal relations refer to revenue allocation between Basque institutions. Around 70% of funds accrue to the budget of the Basque Regional Government, responsible for the main spending programmes, such as healthcare or education, 18% is retained by provincial governments, and the last 12% is distributed by each province across municipalities within its jurisdiction.

The Economic Agreement recognise Basque provinces' autonomy to organise their own local funding scheme, in contrast to the homogeneous regime in force for the rest of Spanish municipalities. Therefore, the local equalisation formula in the three provinces differ, although the economic relevance of transfers for local budgets is similar, ranging between the 43% and 53% of local revenue in 2018 (OCTE, 2020). Also, the structure of the three schemes follows a similar rationale. First, the global amount of transfers for local entities is determined according to the revenue expected to be raised by the provincial tax administration. Second, this funding cap is allocated across the capital city, which receives a fixed amount, and the rest of municipalities. This second component is distributed according to the local equalisation formula. Although the three Basque provinces apply a very similar formula, the variables used and weights attributed to them differ. As observed in Figure 3 for the municipal financing fund (*Udalkutxa*) of the province of Bizkaia, grants are mostly based on indicators of expenditure needs, such as population, the number of school units, unemployment, population dispersion or the existence of beaches. The revenue component is incorporated through the fiscal effort,

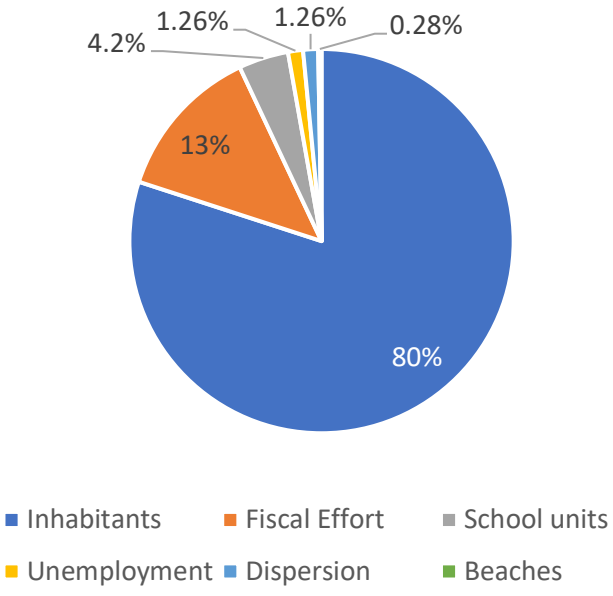
which represents 13% of the funds transferred. Fiscal effort is defined as the gap between potential and actual revenue in five local taxes, and its inclusion in the formula is meant to introduce incentives against local tax competition. This component represents 5% of transfer allocation in Alava and 3.5% in Gipuzkoa. However, in the latter case an additional 3% is determined according to the inverse of local income as a proxy of fiscal capacity. Transfers received are not earmarked, meaning that municipalities can use them to fund any programme within their jurisdictional competence.

Figure 2. Basque Intergovernmental Fiscal Relations System (and Bizkaia's municipal financing fund)



Source: own elaboration.

Figure 3. Local Fiscal Equalisation formula of *Udalkutxa* (Bizkaia)



Source: own elaboration based on OCTE (2020).

6. The Local Sustainability Index

In this section, we further elaborate the proposal for incorporating a green component to local fiscal equalisation scheme by making use of the current local equalisation systems of the Basque Country, described above. Although we would have preferred to use data from all Spanish municipalities, including those who receive their funding through the so-called "common regime" (7,880), data limitations led us to restrict our sample to the 251 Basque municipalities (51 in Araba, 112 in Bizkaia, and 88 in Gipuzkoa).

We will build two indices, one related to changes in fiscal capacity associated to climate mitigation policies (named after "Local Sustainability Index"; hereinafter LSI), and the other additionally related to changes in expenditure needs motivated by climate adaptation policies (LSI+). Composite indicators concentrate complex information and data in just one number, and thus are useful because they allow us to make comparisons based on more than one variable, across different institutional frameworks and time periods. In addition, together with scoreboards and rankings, composite indices are increasingly being used for policy evaluation and communication in all kinds of policy areas, from innovation to sustainability, as they should be easy to interpret (OECD and EC JRC, 2008). Oppositely, usual criticisms focus on the high degree of discretion in their design and argue that aggregation can sometimes lead to important information losses.

6.1 Data and variable selection

We first explain how we have constructed the local environmental performance index LSI, which we will use to re-allocate 5% of the equalisation transfers received by municipalities. The first step in the construction of the LSI is the selection of the variables that will compose it. Our database is based on *Udalmap*, a data platform developed by the Basque Government that includes local-level data for hundreds of variables, of which 50 are related to the environment. We discard those without availability or variability for the selected period, or without apparent relation with local tax capacity and with green outcomes of local policies. As a result, we have restricted the sample to 18 variables divided into seven different environmental areas whose correlation with fiscal capacity will then be tested. Also, although the availability of some of them ranges from 2005 to 2021, in order to get a comprehensive index, we needed to work with a fully balanced panel, which was only possible for the years 2016-2019. Still, we consider that this period allows us to achieve representative results, since these years cannot be considered outliers in terms of economic or fiscal performance.

Table 2 lists the 18 variables used across the seven environmental domains (water, air quality, energy, transport and mobility, touristic pressure, soil use and waste), provides information about their measurement units and the expected sign or their correlation with environmental desirability, and justifies their link with fiscal capacity. Municipalities have the capacity to influence all these variables through policies that lie within their responsibility, including regulation, provision and taxation. For instance, urban waste generation is related to higher economic activity, and in particular tourism, and thus to higher tax capacity, and can be influenced by local policies, such as "Pay as Your Throw" tax schemes (Gatto and Montes, 2021).

Table 2. Selected variables for the Local Sustainability Index

Name	Measurement Units*	Environmental correlation sign	Justification
Water			
Water demand	litres/inhabitant/day	-	Industry and agriculture are water intense and pose a risk for its quality. Both generate an economic and tax revenue impact. Water management and fees are local. Higher economic activity -> Higher local tax capacity, but at the cost of -> Higher water demand and risk of water pollution
Health quality of consumption water	0-3 Index	+	
Air Quality			
PM10µg/m³ excess and number of heavy pollution episodes (OMS 2021 thresholds)	Normalised (50% of weight for each indicator)	-	Mobility, housing, and industry are the main air polluter sectors. These activities broaden the local tax base. Municipalities are responsible for urban mobility (e.g. congestion charges, LEZ…), and share responsibilities on urban planning and housing. Higher economic activity, ownership and use of private vehicles, and use of heating -> Higher local tax capacity, but at the cost of -> Worse air quality
NO2µg/m³ excess and number of heavy pollution episodes (OMS 2021 thresholds)	Normalised (50% of weight for each indicator)	-	
O3µg/m³ excess and number of heavy pollution episodes (OMS 2021 thresholds)	Normalised (50% of weight for each indicator)	-	
Energy			
Installed photovoltaic power capacity	kW per 10.000 inhabitants	+	Renewable power installations compete with economic activity for the use of land, therefore at the cost of local tax revenue. Energy consumption not only generates local tax revenue but is also a proxy of higher economic activity and income. Energy efficiency certificates are only required for selling and renting real estate, therefore are also correlated with higher local tax capacity. Municipalities share responsibility for land use, energy efficiency implementation and certification on buildings. Higher economic activity and income, and a more dynamic real estate market -> Higher local tax capacity, but at the cost of -> Less available land for renewable energy installations (and more real estate with energy efficiency certificates)
Installed wind power capacity	kW per 10.000 inhabitants	+	
Annual non-industrial electricity consumption	kW per inhabitant	-	
Housing with energy efficiency certificates	‰ housing units	+	

* Variables are normalised to have zero mean and one unit of standard deviation, to allow data aggregation afterwards.

**Although this variable has not a direct environmental meaning, it has been included to adjust worse performance in the transport and mobility indicator of rural and more remote municipalities for an increased need of car ownership, allowing comparability and following fair ecological transition political economy rationale (Boroumand et al., 2022).

Source: own elaboration, based on Udalmap.

Table 2. Selected variables for the Local Sustainability Index (continuation)

Name	Measurement Units*	Environmental correlation sign	Justification
Transport and mobility			
Vehicles	Vehicles per inhabitant	-	Vehicles and transport sector generate an economic impact and increase local fiscal capacity. Municipalities are responsible for the urban design and the definition of uses of land and public space. More economic activity and income -> Higher local tax capacity, but at the cost of -> Increased vehicles ownership and use and higher share of land devoted to transport and communication infrastructures.
Land dedicated to transport and communication infrastructure (excluding roads)	0-100	-	
Detour to reach the capital of the province**	0-100	+	
Touristic pressure			
Touristic accommodations	‰ inhabitants	-	Tourism generates an economic and tax revenue impact Higher touristic activity -> Higher local capacity
Soil use			
Surface covered by forest	0-100	+	Use of soil determines activities that can be carried out, generating (or restricting) economic and tax revenue impact. Municipalities are responsible of defining soil uses. Higher economic activity -> Higher local tax capacity, but at the cost of -> Less soil devoted to natural landscape.
Artificial surface	0-100	-	
Non-developable surface	0-100	+	
Waste			
Urban waste generation	kg/inhabitant/year	-	Large-scale retail and tourism-related activities generate economic and tax revenue impact, but also affect waste generation. Waste management is a local responsibility (e.g. municipalities can raise revenue through fees or PAYT schemes) Higher economic activity (retail, tourism) -> Higher local tax capacity, but at the cost of -> Higher volumes of mixed waste
Urban waste collection separation rate	0-1	+	

* Variables are normalised to have zero mean and one unit of standard deviation, to allow data aggregation afterwards.

**Although this variable has not a direct environmental meaning, it has been included to adjust worse performance in the transport and mobility indicator of rural and more remote municipalities for an increased need of car ownership, allowing comparability and following fair ecological transition political economy rationale (Boroumand et al., 2022).

Source: own elaboration, based on Udalmap.

6.2 Composite Index methodology

Next, we use two alternative methodological approaches, Ordinary Least Squares and Principal Component Analysis (PCA), to select the variables significantly related to local tax revenue and then aggregate them to obtain the LSI.

a) OLS *approach*

We first regress local tax revenue per capita on the eighteen variables reported in Table 1. As Table 3 shows, all variables involved in each of the seven sub-indexes are significantly related to tax revenue, except for the PM10 Index and the number of touristic accommodation spots. Also, the sign of the relationships is the expected one, with the only exception of non-developable surface, and renewable energy source installations, as we would have expected to find a negative sign. The positive relationship we find could respond to increased agricultural activity in the former case, and to compensations payments for renewable power installation in the later.

Interpreting the sign of coefficients reported in Table 3 is relevant regarding the justification of the selection of variables used to design the LSI. Indeed, selected variables are supposed to be positively or negatively correlated with fiscal capacity of local governments. However, these signs are not used to calculate the value of LSI sub-components. Since the rationale behind the LSI is to honour good and penalise negative environmental performance, variables are included in the formula according to the environmental correlation sign presented in Table 2 instead. Therefore, coefficients reported in Table 3 are only used to determine the weight each variable has within the corresponding LSI sub-component. For example, the share of artificial surface is positively correlated with fiscal capacity (Table 3). However, the existence of larger shares of artificial surface is an undesired outcome in environmental terms (Table 2). Consequently, this variable will enter the formula to compute the Soil LSI sub-component with negative sign.

We then use the estimated coefficients reported in Table 3 -rescaled to add up to 1 for each category- as the weights to calculate the seven sub-indexes to measure the environmental performance of each municipality in each domain. At this point, the signs of the variables have been modified to reward environmentally desirable outcomes and punish undesired ones, as defined in Table 2. As a result, the larger the sub-index is, the better the environmental performance. As an example of how to interpret these outcomes, forest surface is significantly and negatively correlated with local tax revenue per capita. It determines 26,6% of the value of the soil sub-index. Therefore, an environmentally friendly policy such as increasing forest surface has a potentially negative impact on fiscal capacity of a municipality. As a municipality with larger forest surface will have a larger LSI, through the soil sub-index, then that municipality would be compensated through a larger transfer allocation.

Table 3. OLS Regression results that test the correlation between variables and Local Tax Revenue per capita

Local Tax Revenue per capita	(1) Water	(2) Air	(3) Energy	(4) Transport	(5) Tourism	(6) Soil	(7) Waste	(8) All	(9) Sub-Indexes Weights
iPM10		0.0306						0.0269	0.0773113
		(0.0524)						(0.0354)	
iNO2		0.122*						-0.118**	0.3078061
		(0.0648)						(0.0541)	
iO3		0.243***						0.0199	0.6148826
		(0.0566)						(0.0451)	
Water demand	0.196***							-0.172***	0.8128221
	(0.0188)							(0.0279)	
Water quality	0.0452**							0.0546**	0.1871779
	(0.0188)							(0.0232)	
Photovoltaic			0.0267**					-0.0100	.0365105
			(0.0136)					(0.0253)	
Wind power			0.132***					0.171***	0.1805779
			(0.0136)					(0.0235)	
Electric consumption			0.528***					0.524***	0.7216687
			(0.0137)					(0.0298)	
Efficiency certificate			0.0448***					0.0582*	0.0612429
			(0.0135)					(0.0324)	
Vehicles				0.315***				0.162***	0.3434649
				(0.0146)				(0.0335)	
Infrastructure				0.384***				0.151***	0.4183523
				(0.0147)				(0.0272)	
Detour to the capital city				-0.219***				-0.136***	0.2381828
				(0.0147)				(0.0255)	
Touristic posts					0.00384			-0.0244	-
					(0.0163)			(0.0237)	

Source: own elaboration.

Table 3. OLS Regression results that test the correlation between variables and Local Tax Revenue per capita (continuation)

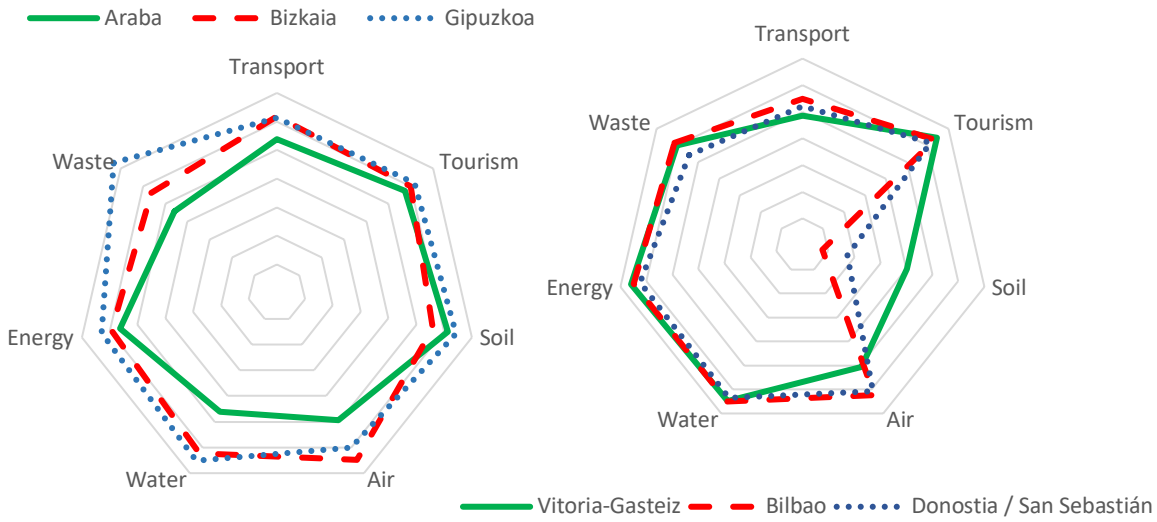
Local Tax Revenue per capita	(1) Water	(2) Air	(3) Energy	(4) Transport	(5) Tourism	(6) Soil	(7) Waste	(8) All	(9) Sub-Indexes Weights
						(0.0226)		(0.0318)	
Artificial surface						0.358***		0.431***	0.3501549
						(0.0611)		(0.112)	
Non-developable surface						0.393***		0.420***	0.38359
						(0.0609)		(0.111)	
Waste generation							0.328***	0.146***	0.7219639
							(0.0222)	(0.0290)	
Separate collection							0.126***	0.0718**	0.2780361
							(0.0222)	(0.0314)	
Constant	0.00168	-0	0.00123	-0	0	0	-0.0533**	0.00333	
	(0.0187)	(0.0360)	(0.0135)	(0.0145)	(0.0163)	(0.0191)	(0.0208)	(0.0230)	
Observations	2,750	753	3,755	3,514	3,765	2,510	2,144	736	
R-squared	0.039	0.027	0.315	0.259	0.000	0.081	0.093	0.623	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: own elaboration.

As shown in Figure 4 and in Table A1 (Annex I), and even if there are many differences within provinces, overall, municipalities in Araba show the worst sustainable performance on average, whereas municipalities in Gipuzkoa stand out as the best. In fact, the latter scores the best in every area but air quality, which is leaded by Bizkaia. The most significant differences are observed in the area of urban waste management, where Gipuzkoa surpasses the other two jurisdictions by a wide margin. This is not surprising since the province is usually presented as an example of good practices in this policy area (Gatto and Montes, 2021; Gainza and Montes, 2023). If we look into the figures for the three capital cities, they record really similar numbers, with Donostia lagging slightly behind. It is soil use the area in which Vitoria-Gasteiz stands out when compared to Donostia and Bilbao, due to the larger extension of the former, which allows for higher shares of natural surface within local borders.

Figure 4. Average subindex values for the three Basque provinces and capitals (2016-2019, unweighted)



Source: own elaboration.

Finally, these sub-indexes are aggregated to construct the LSI by following the same method. First, the seven sub-indexes have been used as regressors to try to explain local tax revenue per capita. Then, the estimated coefficients have been rescaled to sum up 1 so they can be used as weights to aggregate the seven environmental sub-indices into one composite LSI. Touristic pressure area has been excluded due to the lack of significance of the sub-index on tax revenue per capita, which suggests this area would not be relevant. LSI follows a normal distribution and adopts values ranging between -2.89 and 0.58.

Once again, estimates in Table 4 show that higher environmental performance is related to a lower local tax revenue per capita, with the only exception of water. Again, the signs are relevant only regarding the motivation of the use of the subindexes, as only estimated coefficient magnitude are used to compose the LSI. These estimates support the rationale for compensating for the erosion of tax bases arising from environmental protection through green fiscal equalisation. Consistently, while energy and transportation would have the highest weights in the final index, water and soil use would be the ones with the lowest.

Table 4. OLS Results for Sub-Index aggregation

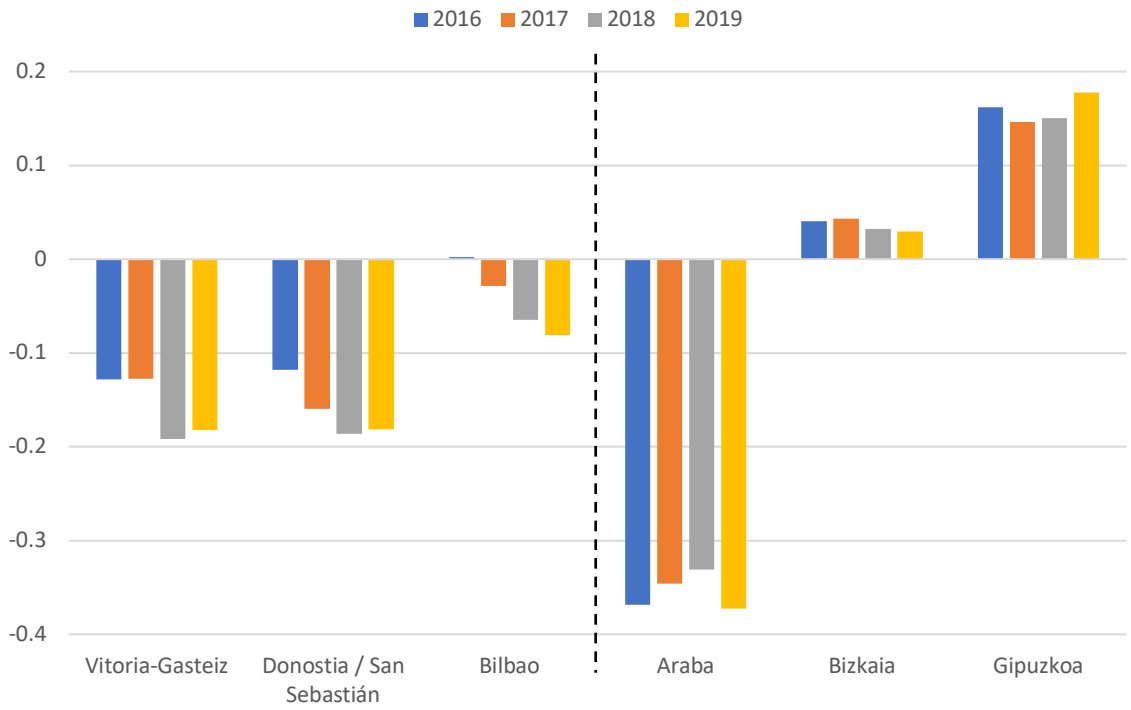
Local Tax Revenue per capita	OLS	Weights
Water	0.142***	0.0779625
	(0.0305)	
Air Quality	-0.271***	0.1488469
	(0.0610)	
Energy	-0.615***	0.3378964
	(0.0369)	
Transport and mobility	-0.556***	0.3052592
	(0.0473)	
~~**Touristic pressure**~~	~~0.0310~~	
	~~(0.0229)~~	
Soil use	-0.0637**	0.0349719
	(0.0259)	
Waste	-0.173***	0.0950632
	(0.0299)	
Constant	0	
	(0.0225)	
Observations	1,004	
R-squared	0.492	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: own elaboration.

Once the six sub-indexes are gathered, results are consistent with those commented in Figure 4, as Figure 5 illustrates. Indeed, while municipalities in Araba perform worse than their peers in Bizkaia and Gipuzkoa, it is Bilbao the city that stands out over Vitoria-Gasteiz and Donostia. There are no clear patterns over time. Cities tended to worsen their performance between 2016 and 2019, but this was not the case for the unweighted average for the provinces. However, cross-province comparisons are not as relevant as within-province differences, since municipal funds are allocated according to three different provincial funds.

Figure 5. Local Sustainability Index for three provinces and capitals



Source: own elaboration.

b) Principal Component Analysis

As an alternative methodological approach, we use Principal Component Analysis (PCA) to build the LSI. PCA is one of the most broadly used techniques to design composite indicators, as it is viewed as a less discretionary methodology when compared to alternative approaches (OECD and EC JRC, 2008). The objective of this methodology is to keep the largest variance of the data as possible in the fewest linear combinations of the original variables as possible. In our case, we use the same 18 variables enumerated in Table 2, after which PCA outcomes suggested some most correlated variables should be dropped in order to attain a more efficient and simpler index, while retaining most of its explicative power/variability. With this aim, we retained 13 out of the 18 variables and the first six principal components. We lowered the usual threshold for eigenvalue equal or higher to one to 0.94 to reach an explicative power of 79%. Together with both, Kaiser-Meyer-Olkin (KMO) measure of 0.7 and a p-value equal to zero in the Bartlett´s test of sphericity, they suggest that our specification is correct.

Table 5. Principal Components

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.68924	1.33301	0.2838	0.2838
Comp2	2.35623	1.14834	0.1812	0.4650
Comp3	1.20788	.132733	0.0929	0.5579
Comp4	1.07515	.0644805	0.0827	0.6407
Comp5	1.01067	.0741336	0.0777	0.7184
Comp6	.936537	.191177	0.0720	0.7904

Source: own elaboration.

Under this specification, PCA extracted six principal components. Next, Table 6 shows the loadings[1] of each variable within each of the six components extracted, grouped according to their sign. As it can be observed, PCA suggests dropping certain variables (PM10, photovoltaic energy installed power and touristic pressure) because their correlation with the rest of the variables was so high that it resulted in a great loss of explanatory power. Variables with the greatest explanatory power are those more often used in EFTs and related to soil use, such as artificial surface, and non-developable surface, followed by NO2 air pollution index. Within variables with negative factors, those with the highest explanatory power are O3 air pollution index, car ownership and water demand. In this case, LSI follows a normal distribution and adopts values that range between -3.65 and 2.83.

Table 6. Principal Component Loadings

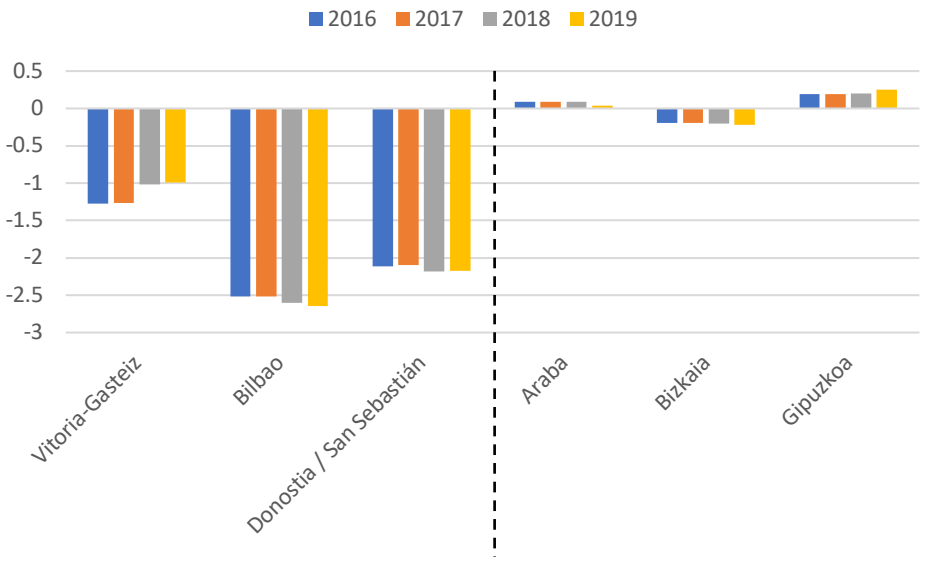
Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6
Artificial surface	.4648	.2024	.09075	-.009403	.00094	-.06881
Non-developable surface	.4639	.2046	.1058	.008776	.006139	-.07935
NO2µg/m³	.4586	-.04973	.07579	-.264	.02861	.009112
Surface covered by forest	.2147	.4244	.1523	.2723	.01102	-.01271
Urban waste collection separation rate	.09578	.245	-.5592	.3616	-.1163	.0308
Installed wind power capacity	.08991	-.1261	-.06678	.1845	.5767	.7615
O3µg/m³	-.4013	.1648	.2144	.3166	-.000187	-.06824
Vehicles	-.3013	.2462	.01365	-.4741	-.01626	.1226
Water demand	-.1727	.4187	-.04127	-.01107	.06296	.1343
Non-developable surface	-.08156	.4524	-.1234	.1913	-.02338	-.004158
Health quality of consumption water	-.05797	.03788	-.1702	-.0473	.7867	-.5836
Detour to reach the capital of the province	-.04914	.09569	.7365	.1959	.1401	.004569
Annual non-industrial electric consumption	-.03066	.4247	-.00441	-.5374	.09786	.1716

Source: own elaboration.

[1] PCA loadings illustrate the importance of independent variables. As coefficients in regressions, they represent the size of the contribution of independent variables to the components.

In this case, as Figure 6 shows, Bizkaia and Bilbao are the worst performers, with Gipuzkoa still as the best ranked province and Vitoria-Gasteiz as the best capital this time. Results for each municipality can be observed in Table B1 (Annex II). Finally, it should be mentioned that differences in results between Indices built using the two methodologies are reasonable. In fact, not all variables used in econometrically-based Index have been retained in the PCA-based Index and while the rationale for signs and weight of the former came from correlations towards per capita local tax revenue and theory, variability maximisation was the criteria applied in the latter case. Therefore, even though the PCA approach could be tecnically superior regarding some mathematical properties, we consider that the OLS approach might be more useful for policymakers due to operational management improvements, such as increased transparency, and understandability for local stackeholders of the formula used.

Figure 6. Local Sustainability PCA Index for three provinces and capitals



Source: own elaboration.

6.3 Using LSI for greening local equalisation

Once the LSI has been constructed, we will use it to re-allocate 5% of the equalisation transfers received by municipalities, as in the Portuguese model. So, in a first approach, 5% of the municipal equalisation fund of each province (*0,05*U*) is redistributed according to the unitary value of the index (V) in this province. Unitary value is the amount of funds paid by each unit of population-weighted LSI ($\frac{p_i}{p} * LSI_i$):

$$V = \frac{0{,}05 * U}{\sum_{i=1}^{n} \frac{p_i}{p} * LSI_i} \quad (1)$$

The participation of each municipality in the share of funds allocated according to the LSI (U_i) is then calculated as the product of its unitary value, times the value of LSI for this municipality multiplied for its relative population:

$$U_i = V * LSI_i * \frac{p_i}{p} \quad (2)$$

Or, equivalently:

$$U_i = \frac{p_i * LSI_i}{\sum_{i=1}^{n} p_i * LSI_i} * 0{,}05 * U \quad (3)$$

In order to interpret the results of the new system, it should be kept in mind that each municipality would stop receiving 5% of its current participation in the *Udalkutxa* of its province that, as explained in Section 5, mostly depends on population:

$$Loss_i \approx \frac{p_i}{p} * 0{,}05 * U \quad (4)$$

In exchange, that share would be allocated according to each municipality's performance on the LSI relative to the rest. In summary, the municipalities that would gain from the change would be those whose per capita environmental performance is better than the average:

$$\frac{p_i * LSI_i}{\sum_{i=1}^{n} p_i * LSI_i} > \frac{p_i}{p} \quad (5)$$

So that,

$$LSI_i > \frac{\sum_{i=1}^{n} p_i * LSI_i}{p} \quad (6)$$

However, the main goal of our proposal lies on setting incentives for local governments to improve their efforts to promote sustainability. Yet this way municipalities in a good starting position would be better-off and receive extra transfers with neither any effort nor improvement. To solve this, we consider a second approach that will allocate 2.5% of the fund based on the baseline index and the other 2.5% according to the year-by-year variation[2] of the index in order to reward not only relative environmental performance, but also relative improvement. It should be kept in mind that since the transfer allocation formula works as a zero-sum game, transfers are allocated according to scores that are relative to the performance and evolution on the performance of the rest of municipalities within each province.

As local funding models for each of the three provinces differ in terms of the variables used and their associated weights, we will follow an approach that allows for equal treatment to every municipality (horizontal equity). Thus, two municipalities of the same size with the same score in the LSI would participate in the same share in the municipal transfer fund of its province. Thus, heterogeneities in per capita funding levels in this case would come from the amount of local funds provided by each provincial government. Therefore, although up to this point all municipalities have been equally treated in the computations regardless of the province they belong to, this will be relevant in the following steps.

Finally, the implementation of the expenditure needs component caused by climate adaptation is proposed. To do so, we use the Local Climate Change Vulnerability and Risk Index created by the Basque Public Agency for Environmental Management (Ihobe, 2019). It actually comprises four indices that measure the risk of each municipality to suffer effects of heatwaves on human

[2] Year-by-year variation of the LSI is calculated and normalised. Then the formula described above for the baseline case is again applied. First, the unitary value is computed to calculate the participation based on year-by-year change on LSI.

health, of draughts on agriculture, and to suffer effects of floods caused by an increase in sea or river levels. In particular, we have made use of the risk indices on the worst-case scenario (RCP 8.5) for the 2071-2100 period. In order to synthesise all four variables in just one composite index, we have calculated the average out of the maximum values for heat and water-level related indicators. This way, we are able to concentrate all the adaptation-need information in just one variable ranging from 0 to 2, with higher values indicating a greater need for adaptation. Again, the formula applied to link environmental variables with local funding replicates the one described above. Yet, in this case 2.5% of the local fund would be allocated according to climate mitigation related fiscal capacity equalisation (1.25% according to the base value of LSI and 1.25% according to the year-on-year change of LSI), and another 2.5% according to climate adaptation related expenditure need component described in this paragraph, the combination of both resulting in the LSI+. It should be noted that in the latter case, although desirable to avoid moral hazard issues, evolution cannot be considered due to lack of data availability.

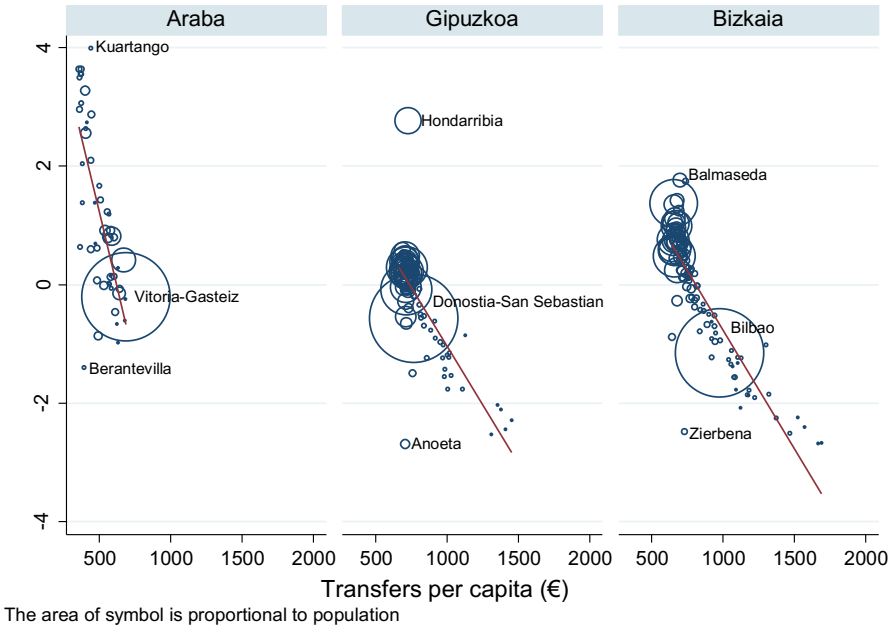
7. Results

We will start by providing the results of the LSI application in the two scenarios explained in the previous section. The first scenario will redistribute 5% of the municipal equalisation fund of each province according to the base value of the index. In contrast, the second scenario will allocate 2.5% of the fund based on the same variable and the other 2.5% according to the year-by-year variation of the index in order to reward not only relative environmental performance, but also relative improvements in it. This section only includes detailed results for the latter scenario, which is the preferred one. Detailed figures of per capita transfers for each municipality under each of the scenarios considered are reported in Table C1 (Annex III).

Figure 7 shows the distributive results the green fiscal equalisation reform based on the LSI would have on local transfers, under the OLS approach, when considering the year-by-year variation. As it can be observed, current local funding systems provide a relatively uniform funding across municipalities. Looking to the data in Table C1 (Annex III)[3], we could state that Araba´s system is the one that provides overall less funding per capita (480€ on average), but also the most evenly distributed (with a standard deviation value of 100€), despite being the one that benefits its capital the most (645€), when compared to Gipuzkoa´s (706€ for the capital vs. 750€ provincial average) and Bizkaia´s (913€ for the capital) systems. While Bizkaia´s system is the most generous (803€), it is also the least evenly distributed among municipalities, since it records the largest standard deviation in per capita funding (with a value of 235€).

[3] Data also represented in maps at Annex IV: Figures D5, D6, and D7.

Figure 7. Change in per capita transfers (%). Current system vs. 2.5% base + 2.5% change OLS-based Index (2019)



Source: own elaboration.

Environmental fiscal equalisation reform would improve the equity of Basque local funding systems, as currently neglected fiscal capacity and expenditure needs would then be considered within the equalisation formula. To the extent that equalisation is aimed at facilitating the provision of similar levels of services at equal tax effort, a reform of the instrument that improves the construction of tax capacity and expenditure needs would enhance the equity of the funding system.

Furthermore, environmental performance of small municipalities measured by the LSI is systematically better than for large cities, and this is also reflected in the change in per capita transfers the green reform would have. Distribution of gains and losses depending on municipality size would differ in each province. While small municipalities in Araba would be, overall, better-off after a reform, the opposite would be true in Bizkaia and Gipuzkoa, where it is medium-sized municipalities the ones that would register the largest wins. This can be explained because it is smallest municipalities those that receive the largest per capita allocations under the current local funding system, since it includes a fix amount paid equally to every municipality to support fixed costs (in 2019: 21,035.42€ in Araba; 84,141.69€ for smallest municipalities in Gipuzkoa; 81,137€ in Bizkaia). Also, the outcome in Araba differs because there is a lack of intermediate cities, with a large population difference between the capital city and the rest of municipalities.

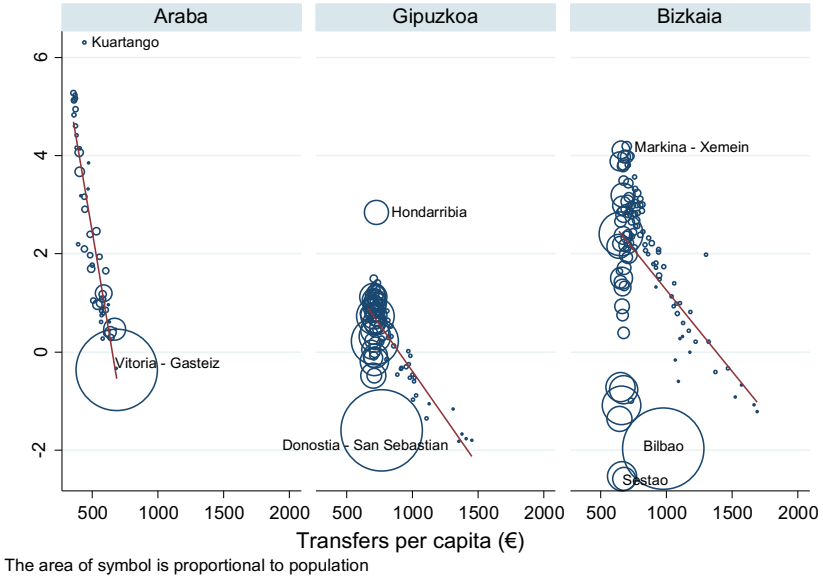
Results are very similar when compared with the baseline reform scenario (Figure D1, Annex IV), that neglects the year-by-year change in LSI. However, the scenario illustrated by Figure 7 shows more even results for Araba and Bizkaia as winners and losers do not record as extreme values, while the opposite is true for Gipuzkoa. Indeed, under the baseline scenario (Figure D1, Annex IV), the transfer loss recorded by worst-off municipalities in Araba and Bizkaia would almost double. This can be explained because these municipalities, Berantevilla (-3.5% in baseline vs. -1.4% in base+change) and Zierbena (-4% in baseline vs. -2.7% in base+change), are bad environmental performers, but show a good positive trend. In contrast, Kuartango (4.3% in baseline vs. 4% in base+change), in Araba, is not only a good performer, but records a positive

trend. Finally, in Gipuzkoa, Hondarribia (-0.3% in baseline vs. 2.8% in base + change) does not stand out for the highest value of LSI, however it does show a very good year-to-year improvement. This case represents a good example of the rationale for considering year-by-year variation within the formula.

In contrast, if the environmental fiscal equalisation reform would apply the LSI designed through PCA instead (Figure 8), wins and losses would be less evenly distributed, with slightly higher maximum and minimum values. In this case, larger losses would be faced by large municipalities, and particularly by capitals (In 2019: Vitoria Gasteiz -0.37%; Donostia/San Sebastián -1.6%; Bilbao -2%). This is particularly the case in Araba, where transfer losses of Vitoria – Gasteiz would fund almost all gains of the rest of municipalities in this province. These changes in the funding distribution among municipalities brought about by the green fiscal equalisation reform makes sense if we consider that it is usually larger cities that incur in more severe environmental problems, such as worse air quality or lower shares of natural surface, to cite just few examples.

Comparing reported PCA-based methodology that considers year-by-year changes in LSI (Figure 8) with baseline (Figure D2, Annex IV), we observe, again, that results are quite similar. As seen for results of the OLS-approach, in Araba and Bizkaia wins and losses for municipalities in the extremes of the distribution tails are larger under the baseline scenario. With highest wins for Kuartango (11.3% in 2019) in Araba, and Markina-Xemein (4.2% in 2019) in Bizkaia, being the highest losses recorded in Sestao and Portugalete (-2.5% in 2019).

Figure 8. Change in per capita transfers (%). Current system vs. the 2.5% base + 2.5% change PCA-based Index (2019)



Source: own elaboration.

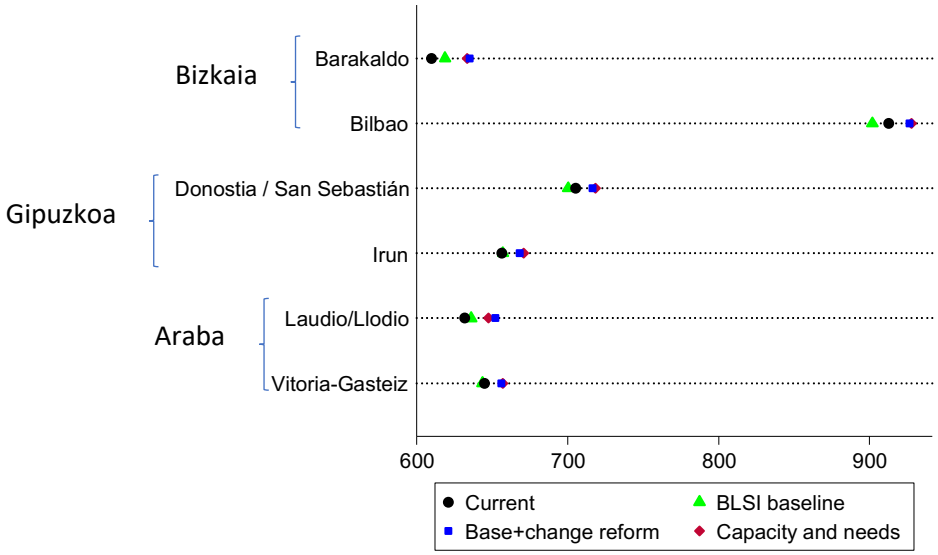
Finally, when considering both the LSI index and expenditure needs for climate adaptation, both OLS and PCA-based approaches reach similar outcomes (Figure D3 and Figure D4, Annex IV). Navaridas (-1.9% OLS and -1.7% PCA), Orexa (-3% and -2.7%) and Nabarniz (-3.3% and -2.6%) are the most negatively impacted municipalities in each province as they record a non-existent risk of suffering floodings neither due to the rise of the sea level nor due to a river overflow, and thus low adaptation needs. Oppositely, Barrundia, Valdegovía-Gaubea (3.7% OLS and 4.5% PCA) in Araba; and Valle de Trápaga-Trapagaran (1.3% and 2%) in Bizkaia would be compensated for

the high risk of suffering both floodings and droughts; being the risk in Hondarribia (1.5% and 1.5%) (Gipuzkoa) limited to very serious flood risk as a coastal municipality (with 2019 data).

Figure 9 and 10 show the results for the two most populated cities in each province for the current system and the three reform scenarios suggested for each of the two Index-building methodologies: allocating the 5% of equalisation transfers received by municipalities according to the base value of the LSI; allocating the 2.5% of the transfers according to the base value and the other 2.5% according to the year by year variation of the LSI; and allocating 2.5% of the local fund according to the LSI (1.25% according to the base value and 1.25% according to the year-on-year change), and another 2.5% according to climate adaptation related expenditure need component.

Both figures show that, overall, large cities would be better-off in case increased expenditure needs for climate adaptation would be considered within the fiscal equalisation formula, when compared to current situation. Yet, the formula that considers both base values of environmental variables and their evolution in time, is the one that benefits the largest cities the most, as even if they record negative results in LSI, they show overall a positive trend within the 2016-2019 period. It is also true, that large municipalities have policy tools and resources (legal, financial and human) that allow them to implement more ambitious environmental policies than smaller municipalities. Therefore, the incentives established by this reform could have a more profound impact on them. Both methodologies show similar results, with PCA-based Index showing larger variability than the OLS-based approach.

Figure 9. Transfer per capita (€) in OLS-Index Scenario (2016-2019)

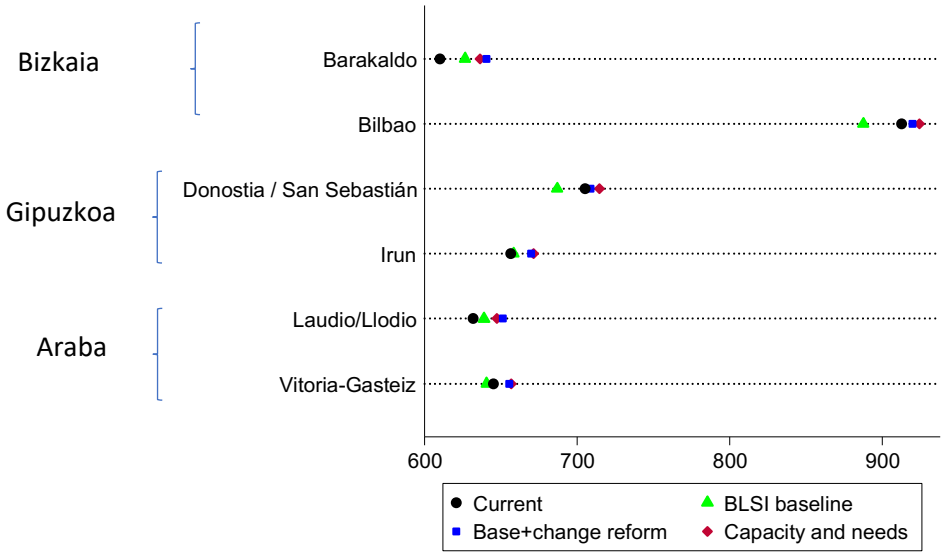


Source: own elaboration.

The exception is Donostia/San Sebastian, whose public budgets would be worst-off in every reform scenario (but the baseline) when compared to the current system due to the relatively worse environmental performance it shows when compared to the rest of municipalities in Gipuzkoa. First, because this capital shows very negative records of soil use and second, because the rest of municipalities of the province outstand among the most sustainable towns in Spain in waste management. However, biggest losses would be faced by the largest city in the Basque

Country, Bilbao, under the LSI baseline scenario, this is the one considering only level values and not yearly changes in variables. In fact, in this reform scenario, and under the PCA approach, the loss would have reached up to the 2.8% of per capita transfers received in 2019. On the opposite side, Barakaldo, the fourth largest city in the Basque Country, would have increased its transfers up to a 3% in the same scenario also in 2019.

Figure 10. Transfer per capita (€) in PCA Index-Scenario (2016-2019)



Source: own elaboration.

In sum, we find that, overall, less sustainable cities could lose up to 5% of their per capita transfers, while small and most sustainable municipalities could win up to 13% of their per capita allocations. More rural towns, and those that could be considered as intermediate cities, would be among the top winners, whereas more industrial and car-intensive cities would be worse-off. In fact, in line with the argument suggested by Loft et al. (2014), these results evidence that environmental fiscal equalisation could serve to compensate rural areas for the ecological services they provide cities with. This is particularly relevant in the current context, first, due to the difficulties of ecological transition´s political economy faces to gather support to pass and make politically feasible implementation of the measures necessary to reach environmental objectives set at the EU within the Green European Deal, and at the international level within the SGD agenda; and second, because of the abandonment feeling rural inhabitants are increasingly voicing through their support to local party platforms, and as explained by the literature of "places that don´t matter" or "territories of despair" (Rodriguez-Pose, 2018).

At this point is relevant to recall that fiscal equalisation´s aim is to allow all jurisdictions to provide its citizens with a standard level of services for an equivalent fiscal effort. Well, then environmental fiscal equalisation would not only set a strong incentive for local entities to cooperate to the international, national and regional green agendas, but would also contribute to close the rural-urban divide regarding the quality and access to basic public services (Alloza et al., 2021). Precisely, this catching-up process to equalise public service standards has also been recently set as objective by the British Levelling-Up agenda (HM Government, 2022).

8. Conclusions and policy recommendations

Academia, policymakers and public opinion are increasingly concerned by sustainability issues and their consequences for the environment, public health and the well-being of citizens. On the search for new tools to promote and attain UN´s Sustainable Development Goals and internationally committed climate objectives, fiscal instruments occupy a central position, with examples that range from carbon taxes or subsidies for green investment, to massive public investment plans, such as the European Green Deal. In a context of increased decentralisation of public finances, engagement of all levels of government is crucial to achieve sustainability goals. Although, in general, regions and cities seem committed to it (Smoke and Cook, 2022), this is not always the case, as local political agendas may differ from central government´s (Oates, 2005). This, combined with lack of subnational institutional capacity can compromise achievement of results.

Following the literature of Environmental Federalism and previous experiences of Ecological Fiscal Transfers (EFTs), we propose a new fiscal equalisation framework to set financial incentives to municipalities to foster more ambitious environmental policies. The main idea behind this tool would be to compensate municipalities for local tax revenue losses caused by environmental protection policies, that also serves as an incentive to adopt effective environmental policies. The main difference between EFTs and our proposal is that we do not defend an ad hoc low-scale arrangement, but a more ambitious one that gets incorporated within the comprehensive and large-scale general fiscal equalisation system instead. Therefore, these will be unconditional grants, rather than earmarked ones. Whereas, Mato Grosso (2009) and May et al. (2012) discuss a positive environmental effect of earmarking transfers to green expenditure, this colludes with the intrinsic unconditional nature of fiscal equalisation transfers. Thus, we combine ETFs approach with Snoddon and Tombe´s (2019) proposal for Canadian carbon pricing revenue equalisation.

We contribute to the environmental federalism discussion by designing a new policy tool and simulating its results on the Basque local funding system. With this aim, we build a Local Sustainability Index measuring local performance in environmental protection and climate change mitigation in seven fields: water, air quality, energy, transport and mobility, touristic pressure, soil use and waste; and thus, the potential tax base loss. We do so for the period 2016-2019 for all Basque municipalities. We apply both an OLS approach and Principal Component Analysis to construct this composite index that would alter the 5% of currently paid transfers to Basque municipalities. Results range from up to 5% loses in per capita received transfers in less sustainable municipalities, to up to 13% wins in per capita allocations in most sustainable and small municipalities. We complement this LSI baseline component with a climate adaptation expenditure need component based on the Basque Local Climate Change Vulnerability and Risk Index, to complete a comprehensive tool (LSI+) that covers both mitigation and adaptation policy areas and fiscal capacity and needs components of fiscal equalisation.

Creating a link between local sustainability results and the volume of transfers municipalities receive would improve incentives towards sustainability and environmental goals achievement. Furthermore, we found that the distribution of budgetary resources among municipalities resulting from this new fiscal equalisation scheme with an environmental component can improve, reducing the relative differences in per capita funding. These changes in resource distribution among municipalities were also seen in Portugal, where Santos et al. (2012) found that the introduction of ecological indicators in the fiscal transfer scheme greatly affected the funding differences among municipalities. And were found in Brazil too, where it benefited low-

income and native communities, since they were the ones living in protected land areas and that way could spend more money coming from EFTs in education, subsistence, healthcare or infrastructure (Nascimento et al. 2011, May et al. 2013).

Redistributing equalisation transfers in this zero-sum game, from large and urban to small and rural local governments would help addressing the gap in access and quality of local public services (Alloza et al., 2021). As in the rest of Europe, Basque rural towns and even intermediate-level cities are experiencing population decline and aging, while economic activity is increasingly concentrating in cities that serve as capital cities. As first suggested by Rodriguez-Pose (2018), the abandonment feeling of these territories is already having political consequences, with the raise of provincial parties in Spain as paradigmatic example.

Finally, this paper is only a start point in the research field on the incorporation of environmental goals into local fiscal equalisation, since it applies the idea of greening intergovernmental fiscal relations introduced by literature on EFTs and illustrates the proposal with an example to stimulate the debate. Furthermore, a logical extension of this research involves adapting the proposed approach, with its relevant specifics, to the realm of regional equalisation, as regional governments grapple with opportunity costs and, consequently, incentive issues regarding the implementation of their environmental policies, in addition to the corresponding expenditure needs, analogous to those considered in the study for local governments.

Further research should extend the analysis for a larger set of jurisdictions and for a more extensive timeframe, as reported simulations outcomes are limited to the Basque country for the 2016-2019 period due to data availability issues. In addition, if equalisation schemes start applying this approach in the future, there will be data available on the behavioural change caused by this policy, paving the way to calculate elasticities and carry out not only static, but also dynamic simulations.

References

Adams, V. M., Pressey, R. L., and Naidoo, R. (2010). Opportunity costs: Who really pays for conservation?. *Biological Conservation*, 143(2), 439-448. https://doi.org/10.1016/j.biocon.2009.11.011

Alloza, M., González-Díez, V., Moral-Benito, E., and Tello-Casas, P. (2021). El acceso a servicios en la España rural. *Banco de España, Documentos Ocasionales*, 2122. https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosOcasionales/21/Fich/do2122.pdf

Anderson, T.L., Hill, P.J. (1996). Environmental federalism: thinking smaller. *PERC Policy Series*, Issue No. PS-8, Bozeman, MT. https://www.perc.org/wp-content/uploads/2018/02/ps8.pdf

Ardiansyah, F., and Jotzo, F. (2013). Decentralization and avoiding deforestation: The case of Indonesia. In Howes, S., and Govinda Rao, M. (eds). *Federal Reform Strategies: Lessons from Asia and Australia*. Oxford, UK: Oxford University Press, 274–302. https://doi.org/10.1093/acprof:oso/9780198092001.003.0009

Azzoni, C. R., and Isai, J. Y. (1994). Estimating the costs of environmental protection in Brazil. *Ecological Economics*, 11(2), 127-133. https://doi.org/10.1016/0921-8009(94)90023-X

Boadway, R., and Shah, A. (2007). Intergovernmental Fiscal Transfers: Principles and Practice. *Public Sector Governance and Accountability.* Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/7171

Borie, M., Mathevet, R., Letourneau, A., Ring, I., Thompson, J. D., and Marty, P. (2014). Exploring the contribution of fiscal transfers to protected area policy. *Ecology and Society*, 19(1). https://www.jstor.org/stable/26269477

Boroumand, R. H., Goutte, S., Porcher, T., and Stocker, T. F. (2022). A fair and progressive carbon price for a sustainable economy. *Journal of Environmental Management*, 303, 113935. https://doi.org/10.1016/j.jenvman.2021.113935

Campos, L. D. R. (2000). ICMS Ecológico: experiências nos estados do Paraná, São Paulo, Minas Gerais e alternativas na Amazônia. *Trabalho apresentado na 3ª reunião temática do programa piloto para proteção de florestas tropicais*. Cuiabá (MT).

Canan, S., and Ceyhan, V. (2020). The link between production efficiency and opportunity cost of protecting environment in TR83 region, Turkey. *Environmental Science and Pollution Research*, 27(28), 35112-35125. https://doi.org/10.1007/s11356-020-09726-9

Cao, H., Qi, Y., Chen, J., Shao, S., and Lin, S. (2021). Incentive and coordination: Ecological fiscal transfers' effects on eco-environmental quality. *Environmental Impact Assessment Review*, 87, 106518. https://doi.org/10.1016/j.eiar.2020.106518

Carattini, S., Kallbekken, S., and Orlov, A. (2019). How to win public support for a global carbon tax. *Nature*, 565, 289–291 (2019) https://doi.org/10.1038/d41586-019-00124-x

Cheng, Y., Ma, B., and Sun, Y. (2023). Does central ecological transfer payment enhance local environmental performance? Quasi-experimental evidence from China. *Ecological Economics*, 212, 107920. https://doi.org/10.1016/j.ecolecon.2023.107920

Clinch, J. P., Dunne, L., and Dresner, S. (2006). Environmental and wider implications of political impediments to environmental tax reform. *Energy Policy*, 34(8), 960-970. https://doi.org/10.1016/j.enpol.2004.08.048

Courchene, T. J., and Beavis, D. A. (1973). Federal-provincial tax equalization: an evaluation. *Canadian Journal of Economics*, 483-502. https://doi.org/10.2307/134086

De Mello, L., and Ter-Minassian, T. (2023). Decarbonisation and intergovernmental fiscal relations: Policy challenges and reform options, *OECD Working Papers on Fiscal Federalism*, No. 43, OECD Publishing, Paris, https://doi.org/10.1787/c434c385-en.

Dougherty, S., and Montes-Nebreda, A. (2023). The multi-level fiscal governance of ecological transition, *OECD Working Papers on Fiscal Federalism*, No. 44, OECD Publishing, Paris, https://doi.org/10.1787/2051f0f7-en.

Droste, N., Lima, G. R., May, P. H., and Ring, I. (2017). Municipal responses to ecological fiscal transfers in Brazil: a microeconometric panel data approach. *Environmental Policy and Governance*, 27(4), 378-393. https://doi.org/10.1002/eet.1760

Droste, N., Ring, I., Santos, R., and Kettunen, M. (2018a). Ecological fiscal transfers in Europe–evidence-based design options for a transnational scheme. *Ecological Economics*, 147, 373-382. https://doi.org/10.1016/j.ecolecon.2018.01.031

Droste, N., Becker, C., Ring, I., and Santos, R. (2018b). Decentralization effects in ecological fiscal transfers: a Bayesian structural time series analysis for Portugal. *Environmental and Resource Economics,* 71(4), 1027-1051. https://doi.org/10.1007/s10640-017-0195-7

Droste, N., Farley, J., Ring, I., May, P. H., and Ricketts, T. H. (2019). Designing a global mechanism for intergovernmental biodiversity financing. *Conservation Letters*, 12(6), e12670. https://doi.org/10.1111/conl.12670

EEA (2007). Climate change: the cost of inaction and the cost of adaptation. *European Environmental Agency Technical Report*. No 13/2007, Copenhagen. https://www.eea.europa.eu/publications/technical_report_2007_13/file

European Court of Auditors (2020). *Annual reports concerning the financial year 2019*. https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=53898.

Ewers, H. J., Rehbinder, E., and Wiggering, H. (1997). Umweltbezogene Erweiterung des Finanzausgleichs. *Zeitschrift für Gesetzgebung*, 2, 135-147.

Ferede, E. (2014). The Incentive Effects of Equalization Grants on Fiscal Policy. *SPP Research Paper*, 07.23. https://dx.doi.org/10.2139/ssrn.2510562

Ferraro, P. J. (2002). The local costs of establishing protected areas in low-income nations: Ranomafana National Park, Madagascar. *Ecological Economics*, 43(2-3), 261-275. https://doi.org/10.1016/S0921-8009(02)00219-7

Gainza, X., and Montes-Nebreda, A. (2023). The Waste War: on the electoral costs of local sustainability policies. *Journal of Environmental Policy & Planning*, 1-17. https://doi.org/10.1080/1523908X.2023.2238638

Gong, C., Zhang, J., and Liu, H. (2021). Do industrial pollution activities in China respond to ecological fiscal transfers? Evidence from payments to national key ecological function zones. *Journal of Environmental Planning and Management*, 64(7), 1184-1203. https://doi.org/10.1080/09640568.2020.1813695

Gonzalez-Garcia, S., Manteiga, R., Moreira, M. T., and Feijoo, G. (2018). Assessing the sustainability of Spanish cities considering environmental and socio-economic indicators. *Journal of Cleaner Production*, 178, 599-610. https://doi.org/10.1016/j.jclepro.2018.01.056

Goulder, L. H. (1995). Environmental taxation and the double dividend: a reader's guide. *International Tax and Public Finance*, 2(2), 157-183. https://doi.org/10.1007/BF00877495

Guo, S., Wen, L., Wu, Y., Yue, X., and Fan, G. (2020). Fiscal decentralization and local environmental pollution in China. *International Journal of Environmental Research and Public Health*, 17(22), 8661. https://doi.org/10.3390/ijerph17228661

Harrison, K. (1996). *Passing the Buck: Federalism and Canadian Environmental Policy*. University of British Columbia Press, Vancouver, Canada. https://dx.doi.org/10.14288/1.0086372

He, L., Wu, M., Wang, D., and Zhong, Z. (2018). A study of the influence of regional environmental expenditure on air quality in China: the effectiveness of environmental policy. *Environmental Science and Pollution Research*, 25(8), 7454-7468. https://doi.org/10.1007/s11356-017-1033-8

HM Government (2022). *Levelling up the United Kingdom*. Secretary State for Levelling Up, Housing and Communities, London. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052708/Levelling_up_the_UK_white_paper.pdf

Hossu, C. A., Iojă, I. C., Mitincu, C. G., Artmann, M., and Hersperger, A. M. (2021). Assessing planning implementation using the conformance and performance approach: The case of

Romania's local environmental action plans. *Journal of Environmental Management*, 299, 113680. https://doi.org/10.1016/j.jenvman.2021.113680

Huang, Y., and Zhou, Y. (2020). How does vertical fiscal imbalance affect environmental pollution in China? New perspective to explore fiscal reform's pollution effect. *Environmental Science and Pollution Research*, 27(25), 31969-31982. https://doi.org/10.1007/s11356-020-09072-w

Ihobe (2019). Evaluación de la vulnerabilidad y riesgo de los municipios vascos ante el cambio climático. *Departamento de Medio Ambiente, Planificación Territorial y Vivienda*. Gobierno Vasco. Vitoria-Gasteiz. https://www.euskadi.eus/contenidos/documentacion/municipios_cc/es_def/adjuntos/vulnerabilidad_municipios_cambio_climatico.pdf

Irawan, S., and Tacconi, L. (2016). *Intergovernmental Fiscal Transfers, Forest Conservation and Climate Change*. Northampton, MA: Edward Elgar. *https://www.e-elgar.com/shop/gbp/intergovernmental-fiscal-transfers-forest-conservation-and-climate-change-9781784716592.html*

Karsenty, A., Vogel, A., and Castell, F. (2014). Carbon rights, REDD+ and payments for environmental services. *Environmental Science & Policy*, 35, 20-29. https://doi.org/10.1016/j.envsci.2012.08.013

Köthenbürger, M. (2002). Tax competition and fiscal equalization. *International Tax and Public Finance*, 9(4), 391-408. https://doi.org/10.1023/A:1016511918510

Kunce, M., and Shogren, J. F. (2008). Efficient decentralized fiscal and environmental policy: a dual purpose Henry George tax, *Ecological Economics*, 65(3), 569–573. https://doi.org/10.1016/j.ecolecon.2007.08.004

Liu, L., Ding, D., and He, J. (2019). Fiscal decentralization, economic growth, and haze pollution decoupling effects: a simple model and evidence from China. *Computational Economics*, 54(4), 1423-1441. https://doi.org/10.1007/s10614-017-9700-x

Loft, L., Pham, T.T., and Luttrell, C. (2014). Lessons from payments for ecosystem services for national REDD+ benefit sharing mechanisms. *Policy Brief*, 68. Bogor, Indonesia: *CIFOR*. https://www.cifor.org/publications/pdf_files/infobrief/4488-infobrief.pdf

Loureiro, W. (2002). ICMS Ecológico-A consolidação de uma experiência brasileira de incentivo a Conservação da Biodiversidade. In *Congresso Brasileiro de Unidades de Conservação*, Vol. 3, 02-12. https://acervodigital.ufpr.br/bitstream/handle/1884/25377/T%20-%20LOUREIRO%2c%20WILSON.pdf?sequence=1&isAllowed=y

Martinez-Vazquez, J. (2021). Adapting Fiscal Decentralization Design to Combat Climate Change. *Climate Governance Papers.* World Bank, Washington, D. C. http://documents.worldbank.org/curated/en/654941625173951298/Adapting-Fiscal-Decentralization-Design-to-Combat-Climate-Change

Mato Grosso (2009). ICMS Ecológico: Conservando a Biodiversidade Mato-grossense. Secretaria de Estado do Meio Ambiente SEMA. Superintendência de Biodiversidade. Coordenadoria de Unidades de Conservação. Mato Grosso, Brazil: SEMA/Cuiabá

May, P. H., Gebara, M. F., Conti, B. R., and Lima, G. R. (2012). The Ecological Value Added Tax (ICMS-Ecológico) in Brazil and its effectiveness in State biodiversity conservation: a comparative analysis, *Proceedings of the 12th Biennial Conference of the International*

Society for Ecological Economics, Rio de Janeiro. https://www.isecoeco.org/conferences/isee2012-versao3/pdf/sp33.pdf

May, P.H., Gebara, M.F., Lima, G., Jordão, C., Nogueira, P., and Grieg-Gran, M. (2013). The effectiveness and fairness of the Ecological ICMS as a fiscal transfer for biodiversity conservation. A tale of two municipalities in Mato Grosso, Brazil. Paper prepared for the Policymix project and presented at the *European Society for Ecological Economics Conference*, Lille: https://policymix.nina.no/Portals/policymix/Documents/Summaries/May%20et%20al%202013%20ICMS-E.pdf?ver=D79Ij4KK1xyZ2i8LzhdfVA%3d%3d

Mazziotta, M., and Pareto, A. (2013). Methods for constructing composite indices: One for all or all for one. *Rivista Italiana di Economia Demografia e Statistica*, 67(2), 67-80. https://www.istat.it/en/files/2013/12/Rivista2013_Mazziotta_Pareto.pdf

MITECO (2021a). Directrices para la creación de Zonas de Bajas Emisiones. *Ministerio para la Transición Ecológica y el Reto Demográfico*. Madrid. https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/participacion-publica/borradordirectricesparalacreaciondezonasdebajasemisiones_tcm30-530517.pdf

Montes-Nebreda, A., and Moreno, J. (2022). Acelerar la transición ecológica: el Mecanismo de Ajuste en Frontera y la Unión Fiscal. In Eurobasque (2022). *El futuro de la Unión Europea: Aportaciones a la Conferencia*, 183-244. Dykinson. Madrid. https://www.torrossa.com/en/resources/an/5294415

Mumbunan, S., Ring, I., and Lenk, T. (2012). Ecological fiscal transfers at the provincial level in Indonesia. *UFZ-Diskussionspapiere*, No. 06/2012. Leipzig, Germany: UFZ. https://www.econstor.eu/bitstream/10419/55837/1/687842077.pdf

Musgrave, R.A. (1983). Who should tax, where, and what? In McLure Jr, C.E. (ed), *Tax Assignment in Federal Countries*. Canberra: Australian National University Press. https://openresearch-repository.anu.edu.au/bitstream/1885/114811/2/b11388808.pdf

Nascimento M., Van Bellen H. M., Borget A., and Nascimento, M. (2011). Ecological-ICMS: Analysis of financial aspects and sustainability in the municipalities of the state of Paraná. *Revista Capital Científico*, Guarapuava, 9, 2.

Nieto Masot, A., Cárdenas Alonso, G., and Engelmo Moriche, Á. (2020). Design of a Development Index for Spanish Municipalities. *Sustainability*, 12(21), 8910. https://doi.org/10.3390/su12218910

Nikitina, E. (2019). Opportunity cost of environmental conservation in the presence of externalities: Application to the farmed and wild salmon trade-off in Norway. *Environmental and Resource Economics*, 73(2), 679-696. https://doi.org/10.1007/s10640-018-0278-0

Niskanen, W. A. (1971). *Bureaucracy and representative government*. Chicago, Aldine Atherton. https://worldcat.org/en/title/162572

Oates, W.E. (1972). *Fiscal Federalism*. Harcourt Brace Jovanovich, New York.

Oates, W. E. (1999). An essay on fiscal federalism. *Journal of Economic Literature*, 37(3), 1120-1149. https://www.jstor.org/stable/2564874

Oates, W. E. (2005). Toward a second-generation theory of fiscal federalism. *International Tax and Public Finance*, 12(4), 349-373. https://doi.org/10.1007/s10797-005-1619-9

OCTE – Órgano de Coordinación Tributaria de Euskadi (2020). Informe Anual Integrado de la Hacienda Vasca 2018. *Departamento de Economía y Hacienda.* Gobierno Vasco. Vitoria – Gasteiz. https://www.euskadi.eus/contenidos/informacion/iai_2018/es_def/adjuntos/IAI2018.pdf

OECD, and EC JRC (2008). Handbook on constructing composite indicators: methodology and user guide. *OECD Publishing*. Paris. https://www.oecd.org/sdd/42495745.pdf

OECD (2020). A Territorial Approach to the Sustainable Development Goals: Synthesis report, OECD Urban Policy Reviews, *OECD Publishing*, Paris, https://doi.org/10.1787/e86fa715-en

OECD (2021). Fiscal Federalism 2022: Making Decentralisation Work, *OECD Publishing*, Paris, https://doi.org/10.1787/201c75b6-en.

OECD (2023). City-to-City Partnerships to Localise the Sustainable Development Goals, *OECD Urban Studies, OECD Publishing*, Paris, https://doi.org/10.1787/d2fe7530-en.

Olson, M. (1969). The principle of "fiscal equivalence": the division of responsibilities among different levels of government. *American Economic Review*, 59(2), 479-487. https://www.jstor.org/stable/1823700

Onrubia, J. (2016). Financiación autonómica y administración tributaria, *Mediterráneo Económico*, 30, 231-271. https://www.publicacionescajamar.es/publicacionescajamar/public/pdf/publicaciones-periodicas/mediterraneo-economico/30/mediterraneo-economico-30.pdf

Petchey, J., and Levtchenkova, S. (2002). The welfare effects of fiscal equalisation in a federal economy with factor mobility and strategic behaviour. Mimeo, *School of Economics and Finance*, Curtin University.

Petchey, J., and Levtchenkova, S. (2004). Fiscal equalisation in Australia: proposals for an efficiency-based system. *Economic Papers*, 23(2), 189–200. https://doi.org/10.1111/j.1759-3441.2004.tb00364.x

Reckien, D., Salvia, M., Heidrich, O., Church, J. M., Pietrapertosa, F., De Gregorio-Hurtado, S., D'Alonzo, V., Foley, A., Simoes, S. G., Lorencová, E. K., Orru, H., Orru, K., Wejs, A., Flacke, J., Olazabal, M., Geneletti, D., Feliu, E., Vasilie, S., Nador, C., Krook-Riekkola, A., Matosovic, M., Fokaides, P. A., Ioannou, B. I., Flamos, A., Spyridaki, N-A., Balzan, M. V., Fülöp, O., Paspaldzhiev, I., Grafakos, S., and Dawson, R. (2018). How are cities planning to respond to climate change? Assessment of local climate plans from 885 cities in the EU-28. *Journal of Cleaner Production*, 191, 207-219. https://doi.org/10.1016/j.jclepro.2018.03.220

Ring, I. (2001). Ökologische Aufgaben und ihre Berü cksichtigung im kommunalen Finanzausgleich. Zeitschrift fu¨ rangewandte Umweltforschung, *Sonderheft* 13, 236-249.

Ring, I. (2002). Ecological public functions and fiscal equalisation at the local level in Germany. *Ecological Economics*, 42(3), 415-427. https://doi.org/10.1016/S0921-8009(02)00124-6

Ring, I. (2008a). Integrating local ecological services into intergovernmental fiscal transfers: The case of the ecological ICMS in Brazil. *Land Use Policy* 25, 485–497. https://doi.org/10.1016/j.landusepol.2007.11.001

Ring, I. (2008b). Compensating municipalities for protected areas: Fiscal transfers for biodiversity conservation in Saxony, Germany. GAIA: *Ecological Perspectives for Science and Society* 17, 143–151. https://doi.org/10.14512/gaia.17.S1.12

Rodríguez-Pose, A. (2018). The revenge of the places that don't matter (and what to do about it). *Cambridge Journal of Regions*, Economy and Society, 11(1), 189-209. https://doi.org/10.1093/cjres/rsx024

Rose, M. T. (1999). Überlegungen zur Berücksichtigung der ökologischen Ausgleichsfunktion ländlicher Räume im kommunalen Finanzausgleich–dargestellt am Beispiel des Landes Nordrhein-Westfalen. *Zeitschrift für angewandte Umweltforschung*, 12(2), 267-279.

Santos, R., Ring, I., Antunes, P., and Clemente, P. (2012). Fiscal transfers for biodiversity conservation: The Portuguese Local Finances Law. *Land Use Policy* 29, 261–273. https://doi.org/10.1016/j.landusepol.2011.06.001

Scheberle, D. (1997). *Federalism and Environmental Policy: Trust and the Politics of Implementation*. Georgetown University Press, Washington, DC. https://press.georgetown.edu/Book/Federalism-and-Environmental-Policy

Schick, A. (1998). Why Most Developing Countries Should Not Try New Zealand's Reforms, *World Bank Research Observer* 13, 125–31. https://www.jstor.org/stable/3986392

Smoke, P., and Cook, M. (2022). *Administrative Decentralization and Climate Change*. World Bank. Washington. http://hdl.handle.net/10986/36911

Snoddon, T., and Tombe, T. (2019). Analysis of Carbon Tax Treatment in Canada's Equalization Program. *Canadian Public Policy*, 45(3), 377-392. https://doi.org/10.3138/cpp.2019-036

Spanish Government (2020). Executive Summary: Recovery, Transformation and Resilience Plan. Madrid: https://www.lamoncloa.gob.es/temas/fondos-recuperacion/Documents/05052021-Executive_Summary_Recovery_Plan.pdf

Stern, N. H. (2007). *The economics of climate change: the Stern review*. Cambridge University press. https://www.lse.ac.uk/granthaminstitute/publication/the-economics-of-climate-change-the-stern-review/

Tang, Z., Brody, S. D., Quinn, C., Chang, L., and Wei, T. (2010). Moving from agenda to action: evaluating local climate change action plans. *Journal of Environmental Planning and Management*, 53(1), 41-62. https://doi.org/10.1080/09640560903399772

Yan, Z., and Honghua, C. (2020). Did the transfer payment in key eco-functional areas improve the eco-environtment? Based on the results of PSM. *South China Journal of Economics*, 39, 125–140. 10.19592/j.cnki.scje.371556

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Abadiño	0.25125886	.09160712	-.11874254	-.01039099	.20524965	.13414476	-.04510801	-0.00966723
Abaltzisketa	.39960016	-.23804589	.37027609	-.18709869	.30456362	.46967555	.89679639	.16540056
Abanto y Ciérvana-Abanto Zierbena	.24411688	.14506192	.12780655	.0132403	.3157993	-1.0467719	-.0320668	.04819512
Aduna	.39452653	.28066676	-2.1160146	-1.0810916	-.25447161	.14357801	1.2422844	-.84935546
Agurain/Salvatierra	.01899979	-.77177262	-.53953978	-.13204744	.3065617	-.42645483	-.03797035	-.35453541
Aia	.40316942	.18316976	-.14139739	.4954192	-2.0941312	.40806773	-1.0064387	.08074557
Aizarnazabal	-.13364972	.40529313	.20282693	.20825999	-.00895174	.02716897	1.0568133	.28342888
Ajangiz	.30872326	.37275111	-.06315247	.4358634	.06324471	.40596569	-.0083231	.20467015
Albiztur	-.05575246	-.28752303	.3976921	-.71186049	.09322408	.62046582	1.3054786	.01573507
Alegia	.39505762	.20689147	.37373368	.04059687	.32540418	.45245091	1.0858128	.31931453
Alegría Dulantzi	.49880606	-.595581	-.0861284	-.16081697	.29806186	-.29468257	-.06655054	-.14458763
Alkiza	-.33451699	-.18934025	.39431948	.03316134	.03069812	.69919745	.91747415	.2007697
Alonsotegi	.12286079	.16861897	-.83215193	.72824714	.29827305	.23629244	-.07417006	-.02298731
Altzaga	.28291519	-.06661797	.50870311	.3352779	.02558551	.52713548	.74647117	.37577334
Altzo	.42027521	.05559736	.47400672	-.39982954	.32540418	.62057873	1.1771541	.21276153
Amezketa	.23877403	-.09187648	.2196892	-.49920657	.24292485	.56258483	1.2339041	.06375819
Amorebieta-Etxano	.36844102	.38795361	-.11138837	.17829562	.27737058	.17875655	-.10686151	.09935177
Amoroto	.07146325	.48221951	-.23986791	.57491429	.1693809	.81274699	-.06276945	.19425191
Amurrio	.14092283	.15670673	.13935516	.05079026	.27810246	.34210548	.00926402	.10974854
Andoain	.33306649	.23012876	.24790261	.34403972	.31709536	-.07501038	.54344684	.29804585
Anoeta	.41525106	.28593987	.21121962	-.62936642	.30253181	-.04327478	1.0926029	.05653865
Antzuola	.38256975	-.15748849	.50178393	.55488558	.2889415	.73589864	.8968886	.45631616
Arakaldo	.20787089	.41836796	.27683478	-.12782488	-1.382441	.36652277	.20884433	.16567205
Arama	.44594969	-.03698881	.15311461	-1.2905478	.32540418	-.04447806	1.3268438	-.18837449
Aramaio	.31433956	-.34354176	.94133685	-.23484406	.21531691	.78047589	.39244629	.2843595
Arantzazu	.2926266	.48246422	.28116338	.33157722	.20401269	.30750083	-.17490152	.28497546
Areatza	.24245044	.07168363	.31354863	.41600395	-.3386125	.81176911	-.17298371	.27445261
Aretxabaleta	.40132676	-.22578085	.41519058	.46696451	.30042336	.29027933	.72927864	.35999743
Armiñón	.04627687	-.28931357	-.07200864	-.76340787	.21581975	-.42398778	-.43187202	-.35270705

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Arraia-Maeztu	-.72885914	-1.1656712	.0240958	-.56054196	-.06430395	.58857992	-1.0310506	-.4707301
Arrankudiaga	.08734549	.27852252	-.31421179	.00418545	.26437446	.57063714	-.19143164	-.05486834
Arrasate/Mondragón	.36987483	-.04525495	.1462478	.48908061	.2814061	-.03445128	.52618722	.26962946
Arratzu	.30135955	.46358357	.2066033	.37693287	.32540418	.67559962	-.36557567	.26624464
Arratzua-Ubarrundia	.34278072	-.3412722	-2.5877198	-.69060945	.32540418	-.39840139	-1.2894887	-1.245785
Arrieta	-.15651011	.34508439	.12801833	.083388	.26621663	.59577069	-.06838657	.12220887
Arrigorriaga	.10801696	.27212918	.26491547	.41316392	.23471708	-.50051452	.15984001	.26225387
Artea	.24211546	.3860368	-.11176323	-.00094095	.10813223	.56228603	-.18683817	.04018745
Artzentales	-2.3839236	-.01449701	.08946625	.03000581	-.23316566	.5261715	-.12248256	-.14186702
Artziniega	.20988316	.27641389	.39047026	-.09671219	.28793452	.37145223	.05856332	.17848017
Asparrena	-2.2729738	-.89467344	-.55048755	.04885944	.15769034	.35023307	-.26256285	-.4941808
Asteasu	.40344019	.12062594	.17791724	-.06762681	.11109322	.2626578	1.0452524	.19743255
Astigarraga	.29841604	.186371	-.07905046	.2841126	.21952085	-.59391565	.07770655	.0976398
Ataun	.22227616	-.41483573	.34165305	.08349229	.17925394	.86500397	1.0505424	.22663104
Atxondo	.24777995	.05187424	-.25147944	-.20831695	.07561803	.52819491	-.07775848	-.11044578
Aulesti	.24386661	.28368906	.36245259	-.08119939	.32540418	.79716503	-.06694	.18043807
Ayala/Aiara	-.39297164	.00126289	.25672867	-.34743984	.06172161	.44844569	-.16194242	-.04947236
Azkoitia	.39533759	-.07369827	.28382706	.62612899	.30123261	.50398377	.38931649	.36152244
Azpeitia	.4006453	.07359374	.18053542	.506254	.25523983	.36685942	.31853197	.30084088
Añana	-.13216605	-.54982635	-.14023655	-.41797385	-.39662909	.38370972	-.50035747	-.30126623
Bakio	.26483437	.4324843	-.01719574	.26168834	.05570389	.01987404	-.99337988	.06535466
Baliarrain	.36557239	-.09723186	-.13000725	-.21522694	.32540418	.29809394	1.6007158	.06699334
Balmaseda	.25456448	-.01584182	.40259322	.43739067	.29174978	.5519495	-.03834721	.30269809
Barakaldo	.25336535	.26882408	.27629455	.6749623	.26812855	-1.2576746	.11497876	.32611099
Barrika	.25429725	.28868571	.19944203	.11215406	.14196775	-.40701588	-.6510725	.08829528
Barrundia	-.93354183	-.63742751	.76809702	-.5924272	.07655431	.22959258	-.60686736	-.13862845
Basauri	.24492696	-.17522017	.33324052	-.02611077	.31623936	-3.4021538	-.00132044	-.02146089
Baños de Ebro/Mañueta	-.7920493	-.30292464	.23309822	-.35310494	.20826653	-.2317021	-.9057104	-.23006779
Beasain	.39080074	-.13360433	.39290269	.07196671	.26073223	.32788093	.70169514	.2434821
Bedia	.26530023	.34187567	-.03434788	-.45103438	.27474442	.72480171	-.11141372	-.06296147

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Beizama	.33306627	-.18056677	.33170928	-.30227826	-.32137475	.73377365	1.2970215	.16786046
Belauntza	.39451036	.02625332	-.04885295	-.90632335	.32540418	.12321276	1.148142	-.145051
Berango	.26637816	.22891591	.43430251	.18587111	.32540418	-.8065222	-.09860172	.22075004
Berantevilla	-8.1688055	-.34363467	-3.4268119	-1.1323372	.32540418	-.16964336	-1.3482854	-2.3256783
Berastegi	.3951595	-.29326714	.23169131	.21242433	.19542236	.75731831	1.4805847	.29752179
Bergara	.46309936	.09135988	.19635164	.36437183	.27894109	.40977706	.58775119	.29748154
Bermeo	.29044181	.22431313	.34327046	.54366616	.26688993	.24897198	-.03175647	.34366896
Bernedo	-1.9872266	-1.116324	-2.0728582	-.31360999	-.28149171	.28140081	-1.3394492	-1.2347253
Berriatua	.26816414	.36990449	-.01676649	.03847164	.14996551	.58982995	.12091962	.11416683
Berriz	.38326409	.13787922	.4489178	-.04640657	.30605481	.37104384	.08145049	.20864383
Berrobi	.41705156	.2213525	.56893822	.39488296	.2291062	.27218702	1.5128963	.53158545
Bidania-Goiatz	-.01556773	-.43004881	.21816641	.17206562	-.1637715	.52892739	1.0800797	.18219052
Bilbao	.25119362	.11233274	.24494232	-.25448996	.17231779	-2.6135672	.07446399	-.04293879
Busturia	.28884122	.30436352	.2321113	.74586949	.09008851	.5035363	-.36943676	.3564252
Campezo/Kanpezu	-.13808406	-.93567409	-.09094548	-.34474056	.13778051	.5666311	-1.0628798	-.36722748
Deba	.39363373	.27523845	-.09665773	.24204396	-.61567957	.32950612	-.21456092	.10400951
Derio	.29305907	.39881581	-1.082122	.04180203	-.17902701	-2.5916707	-.71693187	-.42946398
Dima	.24396259	.06463819	.22629435	.00932206	.26505177	.6544494	-.13799914	.11771951
Donostia / San Sebastián	.17576188	.03804183	.12275315	-.39368331	.07270999	-2.138375	-.2850659	-.16121462
Durango	.2637527	.26695161	.4322307	.14878805	.27697157	-1.2315958	.2041468	.22810146
Ea	.28266703	.53869515	.05554137	.28719131	-.12701455	.62229377	-.1687835	.21437322
Eibar	.39616409	.0012637	.30314564	.38231842	.28726878	-.16632816	.24391041	.26758215
Elantxobe	.2544388	.34917593	.29998688	.54390745	-.31076676	.43952302	-.23116136	.33260367
Elburgo/Burgelu	-.00673148	-.47730804	.04603088	-.62660515	-.79536731	-.28275219	-.5279207	-.30736811
Elciego	-.60152693	-.36382331	.18132117	-.01785842	-.67869972	-.31957998	-1.0104306	-.15246524
Elduain	.39485166	-.24189257	-.97430452	.42848616	.32540418	.94431057	1.4805847	-.02986256
Elgeta	.40687604	-.0241047	.32025474	.10412803	.11762237	.73622287	.57234517	.24828817
Elgoibar	.39359309	.186177	.16149165	.31040723	.29699937	.4034055	-.03723124	.218288
Elorrio	.25311001	.15189884	.12699964	-.32124324	.24417946	.30944779	-.06714354	-.00836787
Elvillar/Bilar	-.77000836	-.50018989	.30413171	.14793263	.32540418	-.19192926	-1.0334445	-.09151534

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Erandio	.09438143	.19340878	-.23642187	.41809013	.31458985	-1.2775649	-.22366115	.01794547
Ereño	.06302004	.26637366	.29959033	-.01170675	.01310355	.81755632	-.43870095	.12910616
Ermua	.23795708	-.02041806	.40162968	.23145949	.29041822	-.61858017	.31475997	.23016609
Errenteria	.36664435	.19250832	.44632503	.5546458	.31368527	-.20329307	.35329315	.40383674
Errezil	.7555998	-.2072741	.32042712	.31303277	-.04880481	.57562441	1.2897919	.37462603
Erriberagoitia/Ribera Alta	-.20717667	-.60399542	.33930692	-.93720385	-4.2556296	.40090165	-.65765829	-.32599313
Errigoiti	-.26119215	.362066	.41753827	.38631519	-.10711161	.65321893	.39604802	.353034
Eskoriatza	.13411894	-.39187117	.33079338	.28635818	.20952886	.50469989	.658444	.23155888
Etxebarri	.27155698	.10946783	.48790912	.48782287	.32540418	-1.9227547	.17792093	.30091172
Etxebarria	.24335747	.24464531	.19953706	-.06856061	.05986721	.59714682	.08315852	.13067021
Ezkio-Itsaso	.37736845	-.08460883	-.71635408	-.42586272	.11600395	.57199706	.58557591	-.2795546
Forua	-.01110402	.35232487	.2479884	.4052555	.32540418	.43516054	-.24295502	.25120141
Fruiz	.25276201	.52982356	-.17270453	.48405966	.32540418	.19963825	-.03874055	.19127488
Gabiria	.39865093	-.09086101	.06040403	-.4317179	-.0488485	.54177252	1.1023488	.02991948
Gaintza	.27951957	-.06647918	.38046096	.06410366	.32540418	.65886814	.43312426	.22423747
Galdakao	.24945345	.34620146	.21699305	.2276438	.3148087	-.4301075	.11920379	.21008077
Galdames	.09552175	.10081511	.1349191	.52850043	.32540418	.51727754	-.14113706	.23404464
Gamiz-Fika	.25314423	.46996516	.37562139	.40879955	.23537036	.17448996	.0128624	.34872451
Garai	-.32503424	.23001455	-1.0250757	-.07021972	-.03491077	.63534395	-.12974809	-.34902322
Gatika	.25558532	.49015585	.38647278	.12315579	.2310269	.22669487	.00144362	.26913161
Gautegiz Arteaga	.2870908	.48919453	-.15655075	.02987673	-.18452732	.27219627	-.31992272	.03052596
Gaztelu	-.74712881	-.10894388	.41702379	.28100687	-.05249198	.79701823	1.5112386	.32376312
Gernika-Lumo	.29969916	.21799928	.27036017	.50488127	.27025883	-.7524655	-.03334326	.27180232
Getaria	.39452664	.26949458	-.86615868	.23802223	-.44253965	-.17391338	-.62699428	-.21482785
Getxo	.24606618	.0142554	.47677687	.08214146	.30494021	-3.6202598	.12985687	.09321873
Gizaburuaga	.25553057	.47796965	-.18356961	-.0600201	-.06081748	.69264465	-.2051623	.01543661
Gordexola	.24568471	.38199738	.05420416	-.22392072	-.0765885	.78445218	-.14668562	.03946421
Gorliz	.25562032	.37405667	.15953272	.48010919	-.12961301	-.79437451	-.66219727	.18533788
Güeñes	.25425215	.23584395	.27814268	.46901455	.30085307	.32837182	-.11023302	.29308585
Harana/Valle de Arana	-.47774791	-1.2664412	.40798438	-.54300732	-.1108232	.51040439	-.78146422	-.31009243

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Hernani	.29968439	.19382432	-.08545907	.75048403	.28366666	.134868	.72025243	.32561619
Hernialde	.14169497	-.12707671	.22069983	-.30238658	.32540418	.39274973	.63604964	.04859942
Hondarribia	.2254721	.26479783	.07848021	-.25745854	-.16283688	-1.2868371	-5.1120937	-.52605568
Ibarra	.38657044	-.07609779	.49572743	.19255118	.32540418	-.21868214	1.0468682	.3369645
Ibarrangelu	.12930391	.3991089	-.2112591	.27042988	-.64940331	.61745002	-.41166719	.06311348
Idiazabal	.39537977	-.21507567	.15966371	-.25792395	.19627106	.50560241	.92339027	.07948988
Igorre	.26200076	.39730337	.29895779	.26350616	.28515125	.218727	-.15173978	.25424246
Ikaztegieta	.39557323	.31774734	.02956893	-.0376975	.32540418	-.1587885	1.1375046	.17920098
Irun	.23070043	.17818105	.1801186	-.03961567	.23290853	-.71466858	.80601102	.14490472
Irura	.41640343	.07075873	.55569794	.00746752	.32540418	-.16705726	.77259822	.30064726
Iruraiz-Gauna	.21255615	-.77610608	.36074657	-.75874297	.32540418	.15702641	-.23202832	-.22523368
Iruña Oka/Iruña de Oca	-.61174919	-.53023539	-.296117	-.53790858	.30947464	.04058279	-1.1129338	-.49525554
Ispaster	.25022241	.41759091	.26322162	.22469324	-.17621692	.73585253	.19967076	.28391186
Itsasondo	.59308096	-.07547998	.29427231	-.10746254	-.1225775	.70854929	1.3907229	.25861859
Iurreta	.23478342	.39532427	-1.1830214	-.29191335	.32540418	-.02855836	-.05551802	-.41797724
Izurtza	.27583419	.22370819	-2.5906216	-.60597104	.32540418	.30978915	-.15780971	-1.0097049
Karrantza Harana/Valle de Carranza	-4.0183512	-.16120442	.20275197	.13652282	-.09803687	.3248874	-.12559593	-.22766916
Kortezubi	.28643752	.51708522	.10746895	.25056608	.17759996	.65782442	-.41210534	.19592818
Kripan	-.13796019	-.80634164	.25348865	.31971058	.32540418	.06801154	-.98037623	-.03834885
Kuartango	-.67185899	-.67729995	2.3301518	-.47854726	.18623511	.45524951	-.71443936	.43607918
Labastida/Bastida	-.73748008	-.45676952	.06336582	.13650202	-.30087002	-.02124608	-.94008967	-.15251587
Lagrán	-.92974487	-1.3773998	-.10445639	-.34332682	.17383644	.65150236	-.84746816	-.47538474
Laguardia	-1.9483612	-.66775681	-.83581165	-.38834786	-1.2865442	-.15827461	-1.1843679	-.77038206
Lanciego/Lantziego	-.73727811	-.33597914	.29550048	.32105729	.25040717	-.24225944	-.86258734	-.00010783
Lanestosa	-2.0468754	.03640156	.10647104	.41856994	.32540418	-.97767429	-.14456633	-.03834684
Lantarón	-.54753255	-.40715605	.19578491	-.52237407	-.00729945	-.02855196	-.54194933	-.24911332
Lapuebla de Labarca	-.71444109	-.22174786	.35250271	-.00861342	.17113002	-.64537198	-.85828956	-.07638764
Larrabetzu	.24276391	.53159254	-.17543442	.32747094	.19988832	.38892266	-.76441711	.07967066
Larraul	.10660121	-.04687745	.418037	.11334594	.32540418	.58243873	1.4122734	.33181058

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Lasarte-Oria	.3731262	.09533129	.44874835	.544964	.26266867	-1.3637989	.14018366	.32689702
Laudio/Llodio	.35105947	.31989047	.44046007	.24902585	.30959289	.17742411	.15839898	.32109423
Laukiz	.2569136	.38582597	.30609614	.09086419	.21141788	-.52375114	.00890552	.19115455
Lazkao	.37009493	.00532403	.54660465	.15252044	.26203442	.15921002	.72732567	.33560976
Leaburu	.15746197	.20089706	.18242059	-.22566811	.29046364	.26676635	.64282459	.10536929
Legazpi	.38761391	-.60499662	.4278633	.41801703	.28250307	.62510004	.98138485	.32749898
Legorreta	.22723663	.16291876	-.27206322	-.00893479	.26964481	.40739392	.82473583	.03995862
Legutio	-2.3311042	-.28144841	-2.473325	-.72785761	.16900465	-.39155918	-.27983745	-1.32184
Leintz-Gatzaga	.76569262	-.62260766	.27782064	-.07347271	-1.5402715	.87276582	1.0172686	.16569554
Leioa	.26492628	-.00759336	.12918055	.16671753	.27970985	-3.4024108	.1257553	.00703176
Lekeitio	-.05462673	.27023585	.32853369	.6074856	.16901959	-2.7776562	.04386578	.23944598
Lemoa	.2474095	.32421449	.11838103	-.10315394	.32540418	.10007873	-.11791271	.0683496
Lemoiz	.0889232	.43954472	.2824634	.47247095	.22132104	.25885031	-.52198397	.27145802
Leza	-.80806776	-.69405291	-.52678291	-.0943107	.00629987	-.01040271	-1.0583192	-.47406482
Lezama	.25465057	.42040044	.12338591	.27633133	.20095011	.02340475	-.71517823	.14130421
Lezo	.23588531	.07681177	-.12882475	-.45915167	.26779592	-.5275284	.12817783	-.16012994
Lizartza	.30091463	.03033989	.51637754	.02463919	-.01180469	.6814181	1.6633997	.39193803
Loiu	.26310434	.32292183	-2.1105402	-3.1066542	.20227643	-1.5440773	-.84213155	-1.7269554
Mallabia	-1.2233579	.05851807	-2.6661072	-.44498387	.04183912	.48616842	-2.4983182	-1.3438651
Markina-Xemein	.25082986	.32467461	.17170368	.33292272	.25957512	.71659773	.12802067	.26475872
Maruri-Jatabe	.26967127	.45370041	.23567886	.22139454	.24440788	.59731313	-.05393276	.25153603
Mañaria	.24450761	-.05285697	.24714083	-.06200435	.32540418	.65083435	-.05323917	.09347525
Mendaro	.38657721	.1775297	-.12716869	.56414218	.27735052	.74551907	-.52290746	.16216597
Mendata	.11489465	.4985847	.4172141	.20881613	.29027965	.89734176	-.33749767	.28718655
Mendexa	.07598876	.3559944	.05459935	.29691421	-13.891365	.38921311	-.21538157	.1611343
Meñaka	.00102704	.30991068	.21504198	.09537993	.03925022	.43460981	.01154978	.16428389
Moreda de lava/Moreda Araba	-.74223706	-.23335296	.36853502	-.20172038	.32540418	-.22458539	-.87617868	-.12079738
Morga	.25419081	.44361274	.18228982	.11268486	.05931339	.66221886	-.35382426	.17136426
Mundaka	.28545938	.13085579	.22912037	.38712441	-1.4896716	-.22909728	-.87806835	.1458409

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Mungia	.26009353	.37608874	.1733065	.41651383	.2524307	-.43951839	.12313251	.25829607
Munitibar-Arbatzegi Gerrikaitz	.255342	.19849358	.62001698	.0795704	.0103812	.79766166	-.03161655	.3081335
Murueta	.1225718	.49338213	-1.5300473	.48048293	-.51041537	.09924229	-.69063074	-.3495141
Muskiz	.24631075	.31135492	.36131523	.1532867	.23791463	-.5593261	-.35601519	.18102187
Mutiloa	.37855828	-.09368834	-.52943803	-.30597879	-.37745745	.5288858	.06977555	-.23160067
Mutriku	.39766302	.27950908	.26079598	.36817476	-.42449136	.50856928	.00432081	.29131398
Muxika	.15922318	.44577984	.3257479	.27786079	.01930771	.69564017	-.29253832	.27017319
Nabarniz	.44428861	.17550938	.27018552	.33624785	.32540418	.76893414	.12785455	.29374466
Navaridas	-.98788591	-.48262434	.43283921	-.33669793	-.30548563	-.15995373	-.94665232	-.20096618
Oiartzun	-.00920413	.12281925	-.67777717	-.41682778	-.12303862	.26037783	-.36542257	-.3643276
Okondo	-.43912356	.25531695	.41499372	-.14995818	.32540418	.72520921	-.08424613	.11556994
Olaberria	-2.7803996	.04714002	-1.7219683	-1.375114	-.24304459	-.27157638	.34362892	-1.1881944
Ondarroa	.24301724	.15855733	.32560891	.21330033	.29018067	-.46538752	.11937323	.21275347
Ordizia	.41424496	-.14900904	.22111536	.12311384	.32540418	-.87895044	.91716771	.17886208
Orendain	.44079674	.15071766	.10161631	.03059346	.32540418	.50209235	1.8411018	.29305429
Orexa	.38721162	.02511152	.23299241	.36325567	.32540418	.75900614	1.6633997	.40821211
Orio	.23958715	.37033903	.30203317	.46748608	-.73745555	-.29735432	-.03687387	.30465857
Ormaiztegi	.38496	.08021198	.38913221	-.10635985	.19994897	.2177404	.94267444	.23819921
Orozko	.02528426	-.0323805	.25856938	-.00193704	.17354237	.65148053	.00729229	.10740657
Ortuella	.25004931	.13029118	.2150688	-.09280705	.29590569	-1.8874828	.01092609	.01825852
Otxandio	-.14020808	-.20340018	.28650786	.24176788	.20932598	.31783652	-.1242138	.12871256
Oyón-Oion	-.71275744	-.47256199	.25192117	.24918888	.29280527	-.33969327	-.9383555	-.06580006
Oñati	.39577578	-.47050013	.92768514	.56774958	.14034723	.61449438	.55187808	.52154873
Pasaia	.44826075	.22294739	.4811582	.5396896	.31979661	-.98681037	.42374033	.40123086
Peñacerrada-Urizaharra	-.59810534	-1.2079227	.05610541	-.75102634	-.45887786	.58003208	-1.8348417	-.59086623
Plentzia	.25934805	.26377655	.30456311	.53607334	.23707195	-.85967042	-.12726817	.28387101
Portugalete	.24156094	-.18023986	.4469192	.51464718	.28451475	-4.4050267	.18797607	.16393524
Ribera Baja/Erriberabeitia	.96128114	-.29328526	-2.3819199	-.15731315	-.54508922	-.89142228	-.60604825	-.91036169
Samaniego	-.93184354	-.59917677	-.3092303	.03857536	-.42129519	-.08502062	-1.1113377	-.36316739

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
San Millán/Donemiliaga	-1.0858966	-.79232193	-1.3800907	-.75829899	-.86741761	.22409949	-.86066012	-.97437913
Santurtzi	.24542711	.09694792	.29353389	-2.1702315	.28494008	-3.1097306	.13642204	-.62551896
Segura	.38484154	-.12729403	.33951965	.00583515	.20543796	.48904192	.97729796	.23756735
Sestao	.23976591	-.20401399	-.31944221	.53141881	.2880039	-4.5977793	.17647467	-.10140874
Sondika	-.32463771	.09645646	-.22622871	-1.98835	.25985082	-1.8323055	-.73408054	-.82821947
Sopela	.26442337	.19911296	.34430456	-.13456291	.00308957	-1.5177087	.03640746	.07589903
Sopuerta	.06625375	.19430863	.27393698	.38725394	.15526291	.56743617	-.11821747	.25346886
Soraluze-Placencia de las Armas	.38574287	.01118158	.43858	.53248013	.32540418	.41090483	.27892176	.38336217
Sukarrieta	.26298084	.2749563	-.56513386	.42969286	.28691866	-.17146188	-.71963608	-.0727672
Tolosa	.40644157	.08424687	.78919267	.21287	.26841204	.27221523	.52151418	.43496963
Trucios-Turtzioz	.24543339	-.16985559	.19836173	.34665131	.25917255	.5482044	-.15582184	.17105516
Ubide	.2152978	-.28654674	.2488324	.04590121	.10288754	.35087181	-.2594761	.05982893
Ugao-Miraballes	.1149135	.38867474	.5126165	.25002343	.32540418	-.17659188	.07646008	.31743796
Urduliz	.28349843	.37288358	.22312519	.48390081	.23141517	-.60768611	-.33609562	.24751092
Urduña/Orduña	.25280339	-.05139768	.31701922	.27871893	.19049524	-.04441474	.07084561	.2094415
Urkabustaiz	-.40868891	-.36544643	-.0084408	-.30426986	.20944158	.40229398	-.42277764	-.20811286
Urnieta	-2.2328023	.11611393	.26734187	.38604368	.02967486	.12455721	-.05679078	.05034283
Urretxu	.2698503	-.24659863	.34536978	.52658712	.28882434	-.00010599	.81439113	.33919242
Usurbil	-.08653739	.32224493	-.59420823	.17188942	.16282035	.07496046	.4240558	-.06415791
Valdegovía/Gaubea	-1.9448641	-.87280558	-.09425665	-.55253347	-1.8841414	.56614291	-1.4864104	-.60355958
Valle de Trápaga-Trapagaran	.2451698	.07529093	-.03971392	-.1919799	.28551263	-1.336838	-.09996893	-.09795705
Villabona	.39274722	.17893148	.41062637	.21672245	.28998821	.32244252	1.0237896	.37075975
Villabuena de Álava/Eskuernaga	-.69743155	-.33939805	-.36101092	-.53230855	-1.1082351	-.19535286	-1.0064359	-.49187506
Vitoria-Gasteiz	.24093235	-.46250073	.29599659	-.56995969	.22571812	-.98671447	.0121217	-.15738228
Yécora/Iekora	-1.0055485	-.59274746	.36913482	.19906709	.32540418	-.11015378	-1.1631191	-.0955494
Zaldibar	.24216301	.06245785	.40515276	-.0457667	.32540418	.29164681	-.0405152	.15745317
Zaldibia	.50092667	-.00540065	.12300818	-.05264305	.16542717	.46148225	1.1409656	.1883466
Zalduondo	-.31539024	-.92294971	.42103866	-.01143491	-.33109231	.27097899	-.72776324	-.0828968

ANNEX I. Table A1. Local Sustainability Index local average values (2016-2019) for the seven sub-indexes (OLS approach) (continuation)

Municipality	Water	Air	Energy	Transport	Tourism	Soil use	Waste	TOTAL
Zalla	.24717415	.1311244	-.03313622	.46255325	.27982517	.27163424	-.13460797	.16549309
Zambrana	.11775856	-.61303377	-.33744212	-.34081439	.32540418	.269169	-.45248597	-.333726
Zamudio	.24243812	.38690284	-3.326052	-.39525706	.15127933	-.75779789	-.87379886	-1.2775941
Zaratamo	.25496937	.39964321	-.89579223	-.87356043	.27771184	.24618387	-.11846107	-.49263537
Zarautz	.3974897	.25627439	.1855953	.30546478	-.32615195	-.79342052	-.03757922	.19377303
Zeanuri	.24465509	-.20030572	.06929118	.17413665	-.66369059	.69111128	-.15936851	.07484848
Zeberio	.23615667	.39311381	.34703115	.06292453	.07496506	.90496589	.13728191	.2580928
Zegama	.40033608	-.73438589	.07638992	-.17019661	.18622387	.79885962	.9209746	.01124636
Zerain	.38884859	-.31696821	.14790502	-.2114488	-1.1051077	.66398608	.78473054	.06638559
Zestoa	.17685643	.30216743	.03552158	.32192594	-.27597864	.36771599	.42951577	.22272916
Zierbena	.25147187	.28131765	-4.2231672	-3.0398539	.12374292	-2.2407505	-2.1421363	-2.5754591
Zigoitia	-.44626914	-.49360684	-1.5105392	-.44291673	.13366534	.34725337	-1.0226766	-.83894901
Ziortza-Bolibar	.22750599	.15596963	.24975099	.79017425	-.48102249	.71549819	-.86509225	.30933433
Zizurkil	.39163016	.21532429	.38017856	.26155899	.28422735	.33997416	.88394617	.36680733
Zuia	-.56748813	-.52682018	-.17388644	-.27683783	-.07068049	.56271071	-.68898513	-.31173928
Zumaia	.40778412	.36309467	.2013737	.06760259	-.0297655	-.93565241	-.02749783	.13918158
Zumarraga	.41842609	-.18160375	.29706817	.54902498	.24433054	.18090369	.69790368	.34623506

ANNEX II. Table B1. Local Sustainability Index local average values (2016-2019) (PCA approach)

Municipality	PCA Index Value	Municipality	PCA Index Value	Municipality	PCA Index Value
Abadiño	-.20971252	Arrankudiaga	.48671012	Belauntza	.32518961
Abaltzisketa	.50545571	Arrasate/Mondragón	-.13017858	Berango	-.95867632
Abanto y Ciérvana-Abanto Zierbena	-.90224584	Arratzu	.57287626	Berantevilla	-.63266403
Aduna	.34222777	Arratzua-Ubarrundia	-.46728492	Berastegi	1.0565115
Agurain/Salvatierra	-.5268426	Arrieta	.62563044	Bergara	.39145657
Aia	.38035852	Arrigorriaga	-.45075601	Bermeo	.07087301
Aizarnazabal	.02061272	Artea	.4445953	Bernedo	.20648272
Ajangiz	.14622452	Artzentales	.60319023	Berriatua	.50733195
Albiztur	.86954743	Artziniega	.18819552	Berriz	.0822188
Alegia	.23484672	Asparrena	.18325404	Berrobi	.46321527
Alegría Dulantzi	-.38959375	Asteasu	.42894172	Bidania-Goiatz	.69734034
Alkiza	.74579482	Astigarraga	-.3489772	Bilbao	-2.5704107
Alonsotegi	.07350184	Ataun	.76935364	Busturia	.53622615
Altzaga	.27679029	Atxondo	.18121927	Campezo/Kanpezu	.38748061
Altzo	.63338677	Aulesti	.80086853	Deba	.11274344
Amezketa	.61544704	Ayala/Aiara	.28723377	Derio	-1.7623724
Amorebieta-Etxano	-.20153852	Azkoitia	.44502423	Dima	.45540024
Amoroto	.83660123	Azpeitia	.36581901	Donostia / San Sebastián	-2.1428196
Amurrio	.06657412	Añana	.25867085	Durango	-1.1651363
Andoain	-.14783656	Bakio	-.06067205	Ea	.60251336
Anoeta	-.11994212	Baliarrain	.30735184	Eibar	-.36916783
Antzuola	.78253868	Balmaseda	.33805687	Elantxobe	.4458544
Arakaldo	.27223056	Barakaldo	-1.1789345	Elburgo/Burgelu	-.26338695
Arama	.06836945	Barrika	-.67133245	Elciego	-.35046898
Aramaio	.69372595	Barrundia	.58478981	Elduain	1.2253761
Arantzazu	.14685623	Basauri	-2.5693226	Elgeta	.68880548
Areatza	.56782372	Baños de Ebro/Mañueta	-.11677192	Elgoibar	.06106673
Aretxabaleta	.26114954	Beasain	.14645521	Elorrio	-.05862417
Armiñón	-.34204909	Bedia	.4187875	Elvillar/Bilar	-.02408931
Arraia-Maeztu	.50201483	Beizama	1.0073478	Erandio	-1.1649588

ANNEX II. Table B1. Local Sustainability Index local average values (2016-2019) (PCA approach) (continuation)

Municipality	PCA Index Value	Municipality	PCA Index Value	Municipality	PCA Index Value
Ereño	.83638473	Hernialde	.36550885	Laukiz	-.36536434
Ermua	-.83820975	Hondarribia	-1.555079	Lazkao	.06297556
Errenteria	-.16567397	Ibarra	-.35903468	Leaburu	.20393201
Errezil	1.0337677	Ibarrangelu	.58300485	Legazpi	.72803377
Erriberagoitia/Ribera Alta	.50122509	Idiazabal	.475685	Legorreta	.20894184
Errigoiti	.79454052	Igorre	-.02145572	Legutio	-.67110773
Eskoriatza	.51341992	Ikaztegieta	-.23855134	Leintz-Gatzaga	.98012606
Etxebarri	-1.5343851	Irun	-.56700532	Leioa	-2.8033795
Etxebarria	.47667582	Irura	-.31359141	Lekeitio	-2.0206449
Ezkio-Itsaso	.62074807	Iruraiz-Gauna	.21414595	Lemoa	-.16352611
Forua	.3039881	Iruña Oka/Iruña de Oca	-.04452669	Lemoiz	.23431071
Fruiz	.17261276	Ispaster	.70107964	Leza	-.10953646
Gabiria	.62539673	Itsasondo	.61487723	Lezama	-.08126925
Gaintza	.59881299	Iurreta	-.38223917	Lezo	-.59709017
Galdakao	-.53724585	Izurtza	-.10547617	Lizartza	.81474429
Galdames	.92197416	Karrantza Harana/Valle de Carranza	.25837786	Loiu	-1.295837
Gamiz-Fika	.27522799	Kortezubi	.52898524	Mallabia	.04616376
Garai	.20304973	Kripan	.26490665	Markina-Xemein	.51540357
Gatika	.12011312	Kuartango	2.7857553	Maruri-Jatabe	.47143675
Gautegiz Arteaga	.35484625	Labastida/Bastida	-.03073192	Mañaria	.44455217
Gaztelu	.93063895	Lagrán	.82517353	Mendaro	.43594351
Gernika-Lumo	-.69697045	Laguardia	-.12569046	Mendata	.84262346
Getaria	-.57713628	Lanciego/Lantziego	-.12673083	Mendexa	.24523006
Getxo	-2.9113213	Lanestosa	-.53715559	Meñaka	.34365907
Gizaburuaga	.66590002	Lantarón	.04535043	Moreda de lava/Moreda Araba	-.16568206
Gordexola	.65145356	Lapuebla de Labarca	-.58681352	Morga	.69988772
Gorliz	-.68254469	Larrabetzu	.21402706	Mundaka	-.31278486
Güeñes	.21842201	Larraul	.75353151	Mungia	-.43156239
Harana/Valle de Arana	.72659291	Lasarte-Oria	-1.2307971	Munitibar-Arbatzegi Gerrikaitz	.95937395
Hernani	.31257508	Laudio/Llodio	-.13494068	Murueta	.02650853

ANNEX II. Table B1. Local Sustainability Index local average values (2016-2019) (PCA approach) (continuation)

Municipality	PCA Index Value	Municipality	PCA Index Value	Municipality	PCA Index Value
Muskiz	-.53147062	Sondika	-1.2618402	Zeberio	.70164935
Mutiloa	.35096714	Sopela	-1.4290622	Zegama	.74968324
Mutriku	.25114177	Sopuerta	.6217954	Zerain	.60821126
Muxika	.69630954	Soraluze-Placencia de las Armas	.25623574	Zestoa	.31207403
Nabarniz	.76818772	Sukarrieta	-.10088699	Zierbena	-2.1129944
Navaridas	-.12027664	Tolosa	.03708481	Zigoitia	-.01333456
Oiartzun	.08285323	Trucios-Turtzioz	.72957429	Ziortza-Bolibar	.38647816
Okondo	.48496725	Ubide	.27749348	Zizurkil	.3144349
Olaberria	-.20105835	Ugao-Miraballes	-.30005299	Zuia	.31299618
Ondarroa	-.61777788	Urduliz	-.57513812	Zumaia	-.92248991
Ordizia	-.85683101	Urduña/Orduña	-.14459176	Zumarraga	.14927204
Orendain	.55409671	Urkabustaiz	.29837001		
Orexa	.9341395	Urnieta	.01216309		
Orio	-.27227302	Urretxu	.13693716		
Ormaiztegi	.25254256	Usurbil	-.02565536		
Orozko	.52561555	Valdegovía/Gaubea	.40946307		
Ortuella	-1.6399788	Valle de Trápaga-Trapagaran	-1.3256586		
Otxandio	.12027811	Villabona	.14617715		
Oyón-Oion	-.3129325	Villabuena de Álava/Eskuernaga	-.07660402		
Oñati	.77787226	Vitoria-Gasteiz	-1.1373658		
Pasaia	-.61163317	Yécora/Iekora	-.05281282		
Peñacerrada-Urizaharra	.42805267	Zaldibar	-.16628793		
Plentzia	-.65109088	Zaldibia	.38266106		
Portugalete	-3.3818573	Zalduondo	.31182519		
Ribera Baja/Erriberabeitia	-.87910204	Zalla	.18306327		
Samaniego	-.09568118	Zambrana	.12456977		
San Millán/Donemiliaga	.50827378	Zamudio	-.75020733		
Santurtzi	-2.4340041	Zaratamo	.30916381		
Segura	.36569071	Zarautz	-.92571013		
Sestao	-3.417837	Zeanuri	.53483235		

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Araba	480.12303 (100.3309)	484.63492 (97.62045)	497.28814 (94.0392)	498.75577 (97.45668)	502.40072 (95.54589)	495.09656 (95.26035)	496.91904 (94.3181)
Bizkaia	803.27798 (234.7061)	798.97153 (223.799)	828.83581 (233.641)	820.17195 (226.0549)	836.69862 (231.2372)	819.21389 (224.8647)	827.47723 (227.4185)
Gipuzkoa	749.70926 (178.8401)	746.1329 (170.6184)	755.8285 (173.4733)	762.10591 (172.5338)	766.45773 (173.7943)	760.35303 (171.2002)	762.52894 (171.8243)
Abadiño	652.40737 (51.34663)	655.06813 (50.95455)	685.43705 (56.54241)	675.65106 (36.34254)	695.45893 (40.77964)	675.47587 (36.54659)	685.37981 (38.71484)
Abaltzisketa	869.29259 (65.42793)	859.80782 (65.30645)	872.74141 (65.8069)	873.87118 (71.98237)	878.77424 (72.74754)	866.34677 (71.58948)	868.7983 (71.97195)
Abanto y Ciérvana-Abanto Zierbena	637.85078 (41.26497)	641.97027 (41.84846)	658.25115 (43.24945)	658.64057 (31.71346)	666.57714 (31.6664)	659.06617 (31.6673)	663.03445 (31.63652)
Aduna	791.30547 (75.48389)	774.46697 (74.32749)	796.85204 (75.9155)	798.81061 (80.9597)	808.87272 (82.97916)	801.07783 (81.03748)	806.10888 (82.04749)
Agurain/Salvatierra	580.60699 (68.57514)	580.08158 (66.53531)	586.11189 (65.5858)	604.8317 (56.65631)	606.43667 (56.25317)	602.96696 (57.05439)	603.76944 (56.83969)
Aia	655.97887 (65.47092)	656.21774 (65.2537)	668.69142 (65.81876)	671.42365 (69.695)	676.82335 (69.8917)	671.98124 (70.5399)	674.68109 (70.6428)
Aizarnazabal	706.2102 (61.04018)	706.21492 (61.69478)	712.31031 (60.70441)	721.29706 (66.31119)	721.44684 (65.39896)	720.01372 (65.57114)	720.08861 (65.1195)
Ajangiz	859.24052 (50.071)	854.17527 (49.64277)	888.45414 (52.64009)	869.78907 (42.03114)	887.90209 (45.6703)	871.86823 (42.63163)	880.92474 (44.37408)
Albiztur	896.28895 (101.6361)	883.76806 (99.32001)	902.52377 (101.0569)	910.84394 (103.4822)	921.90919 (102.2386)	903.85689 (102.0282)	909.38951 (101.4004)
Alegia	659.62509 (62.5596)	662.34016 (62.91477)	670.53653 (63.42909)	676.24053 (68.16716)	679.90989 (69.2506)	674.96404 (68.14101)	676.79872 (68.68252)
Alegría-Dulantzi	530.21814 (37.61264)	534.5918 (37.68512)	539.75305 (35.39253)	548.94072 (30.81145)	547.99605 (28.73084)	547.5912 (31.12035)	547.11887 (30.03373)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Alkiza	844.63641 (59.49522)	836.77367 (59.55806)	852.07535 (60.73277)	842.86431 (71.6736)	849.99556 (71.3064)	834.21387 (70.77573)	837.77949 (70.57831)
Alonsotegi	678.8219 (53.37923)	679.98994 (52.73468)	716.01529 (60.27598)	700.21161 (42.41375)	724.8227 (46.68193)	699.82054 (41.78194)	712.12608 (43.68343)
Altzaga	1107.0374 (42.90453)	1088.0739 (44.61123)	1095.9737 (43.08546)	1103.6775 (44.71306)	1102.4274 (39.75454)	1094.1083 (42.45312)	1093.4833 (39.9583)
Altzo	776.20008 (64.19948)	771.89862 (64.17918)	785.798 (65.48067)	778.27815 (77.46393)	785.77291 (78.88342)	779.51758 (77.18847)	783.26495 (77.8989)
Amezketa	694.2291 (59.82909)	692.38143 (60.15725)	707.65502 (60.40095)	705.47562 (67.63974)	710.57727 (68.9199)	704.56615 (67.55338)	707.11697 (68.18844)
Amorebieta-Etxano	601.77653 (43.27208)	608.32326 (43.73605)	637.51301 (49.1657)	625.68827 (31.80044)	644.68914 (36.30275)	625.90557 (31.63979)	635.40601 (33.81978)
Amoroto	1108.0913 (78.24609)	1090.4821 (77.00034)	1138.1 (81.94837)	1120.3754 (55.85676)	1146.4028 (57.57591)	1120.1811 (55.50916)	1133.1947 (56.364)
Amurrio	555.64473 (37.73339)	561.58905 (37.59275)	568.95079 (36.88381)	575.75419 (24.52789)	578.27733 (23.73685)	573.87916 (24.8502)	575.14073 (24.45386)
Andoain	656.12194 (60.25937)	658.79389 (60.97855)	662.92915 (61.50776)	674.0404 (64.63363)	676.42596 (64.67606)	672.00688 (64.30672)	673.19966 (64.32642)
Anoeta	630.92454 (75.18813)	632.0047 (72.44173)	639.19096 (73.72274)	648.24165 (66.49058)	655.22883 (71.49405)	649.54246 (69.6913)	653.03605 (72.34953)
Antzuola	662.55946 (60.24841)	666.62698 (60.53107)	679.49723 (61.62722)	680.84351 (62.479)	687.36707 (63.6552)	678.24092 (62.26691)	681.5027 (62.85546)
Arakaldo	1458.8017 (78.48232)	1423.3084 (77.16093)	1460.618 (82.17876)	1451.7033 (64.51579)	1473.5522 (63.74459)	1450.7255 (63.28278)	1461.65 (62.90045)
Arama	1025.0729 (95.91274)	1003.8452 (93.73071)	1015.7071 (92.9082)	1021.8077 (109.2162)	1024.3933 (106.2898)	1023.0388 (108.4768)	1024.3316 (106.9902)
Aramaio	558.03462 (41.58734)	565.82531 (41.44861)	578.14831 (41.05775)	578.40689 (34.00182)	583.85644 (33.96481)	575.38551 (34.27334)	578.11028 (34.25495)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Arantzazu	874.52051 (59.55397)	869.70379 (58.819)	903.15842 (63.38025)	879.09799 (66.17242)	898.5855 (70.60368)	876.95645 (66.49309)	886.7002 (68.70203)
Areatza	769.43913 (49.02932)	769.70893 (48.5979)	811.40934 (55.5694)	787.92016 (29.62683)	814.50512 (35.48315)	785.17831 (29.96433)	798.47079 (32.82949)
Aretxabaleta	651.32233 (56.61764)	654.89169 (57.12459)	662.96036 (58.03771)	667.38973 (61.0062)	671.77799 (62.40431)	665.67758 (61.05853)	667.87172 (61.75568)
Armiñón	406.59645 (32.28772)	414.81199 (31.97404)	422.83944 (30.75381)	426.04951 (31.12083)	427.24666 (29.67701)	426.33223 (31.49511)	426.9308 (30.77429)
Arraia-Maeztu	348.30115 (24.48791)	358.1161 (25.28373)	376.78004 (23.35158)	371.47598 (18.64914)	377.05075 (13.01853)	363.94034 (17.77915)	366.72773 (14.91984)
Arrankudiaga	821.82925 (55.01563)	815.49191 (54.71236)	859.68994 (61.59895)	840.89448 (34.3961)	867.36549 (40.12479)	841.09111 (33.27411)	854.32661 (36.10691)
Arrasate/Mondragón	656.9578 (58.266)	659.23888 (58.57896)	663.87891 (58.89407)	673.37622 (60.81878)	675.15046 (62.39089)	671.19169 (61.27219)	672.07881 (62.05664)
Arratzu	994.64165 (48.51381)	983.59031 (48.70982)	1025.261 (52.23801)	1004.6796 (21.72324)	1026.1399 (24.7392)	1004.0363 (21.91913)	1014.7664 (23.43236)
Arratzua-Ubarrundia	451.69022 (29.64373)	447.61309 (29.6155)	464.30141 (29.49051)	466.14658 (24.14419)	472.76563 (22.80961)	469.18023 (24.02658)	472.48976 (23.36322)
Arrieta	878.1904 (39.56993)	871.20361 (40.18538)	915.63106 (43.91003)	888.44325 (24.98079)	910.28616 (27.07267)	878.69847 (24.82)	889.61992 (25.87775)
Arrigorriaga	634.08385 (43.21008)	640.99394 (43.48137)	663.52103 (49.48655)	656.74379 (32.32296)	673.80304 (37.06283)	655.82684 (31.88512)	664.35646 (34.0293)
Artea	869.46816 (56.1382)	861.86377 (55.13823)	904.03624 (61.37761)	883.67805 (34.20485)	909.81334 (39.82352)	883.94897 (35.14775)	897.01662 (37.93085)
Artzentales	991.20566 (83.17259)	975.35659 (82.04135)	1022.5736 (85.63789)	1008.8207 (65.05939)	1032.2559 (62.76379)	999.51612 (64.22868)	1011.2337 (63.07538)
Artziniega	540.21734 (39.35424)	547.72429 (39.64694)	555.63056 (37.6585)	563.10492 (25.31374)	563.62263 (23.96578)	559.60394 (25.5589)	559.86279 (24.87032)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Asparrena	535.90734 (38.93311)	536.09757 (39.50245)	551.48641 (37.55322)	555.76297 (25.97211)	559.00974 (26.03823)	554.63555 (27.51022)	556.25893 (27.52929)
Asteasu	655.84292 (43.05329)	657.42032 (44.66769)	669.0681 (44.00808)	670.18306 (45.86388)	672.76065 (44.08265)	669.66894 (46.11743)	670.95774 (45.20705)
Astigarraga	611.44231 (54.87336)	614.07884 (55.06478)	618.12405 (54.71669)	627.1655 (58.7382)	628.05661 (58.59602)	625.50216 (58.89101)	625.94771 (58.81173)
Ataun	649.85152 (63.44374)	652.03065 (63.75267)	667.27317 (64.60861)	667.07195 (70.51386)	674.28793 (69.31313)	666.75887 (69.30211)	670.36686 (68.70313)
Atxondo	729.79821 (54.13714)	727.35129 (53.43208)	766.45351 (60.76107)	748.27138 (41.5216)	773.82866 (48.26849)	749.1275 (42.01384)	761.90613 (45.31558)
Aulesti	999.89193 (65.61992)	987.52628 (64.99871)	1034.6499 (70.13411)	1011.6672 (52.29362)	1036.9854 (55.01386)	1012.8238 (51.97503)	1025.4829 (53.33786)
Ayala/Aiara	372.94624 (27.99849)	386.25386 (28.70049)	397.81646 (27.0167)	398.0614 (18.66273)	400.44033 (18.67431)	396.30978 (19.49045)	397.49924 (19.49043)
Azkoitia	655.38729 (58.78662)	658.77427 (59.25882)	668.89675 (60.26199)	673.65685 (60.89828)	678.76457 (62.67583)	673.68431 (61.05009)	676.23817 (61.93464)
Azpeitia	652.51716 (56.12562)	655.39789 (57.02417)	665.28175 (57.75554)	670.14005 (59.97491)	674.66859 (60.66245)	669.74865 (59.60714)	672.01292 (59.94765)
Añana	654.19258 (44.56408)	650.58767 (43.82542)	664.69121 (42.56646)	669.77466 (28.42599)	674.93552 (24.87717)	661.38771 (28.46961)	663.96814 (26.68798)
Bakio	704.41114 (40.80486)	705.41948 (41.52984)	737.4948 (44.29136)	720.97688 (32.88893)	737.11792 (34.73923)	719.3606 (33.30177)	727.43112 (34.23272)
Baliarrain	1254.3717 (132.7368)	1224.5308 (128.9637)	1236.3145 (129.1013)	1271.3942 (110.6161)	1275.1662 (111.2648)	1262.9315 (110.4277)	1264.8174 (110.7607)
Balmaseda	659.42165 (39.42486)	665.56404 (39.92619)	702.4069 (44.57379)	680.78675 (30.11709)	700.41234 (33.30551)	678.89227 (29.32836)	688.70506 (31.14883)
Barakaldo	609.88041 (44.21852)	618.80722 (44.95549)	626.49871 (46.73169)	635.07339 (34.62887)	640.44881 (36.78104)	633.54772 (34.25528)	636.23543 (35.33267)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Barrika	657.60304 (35.87541)	661.20992 (36.44518)	681.33608 (37.51608)	675.04335 (25.88296)	684.56946 (26.27215)	675.36343 (26.47993)	680.12649 (26.64045)
Barrundia	336.9978 (22.74431)	351.08358 (23.31048)	366.95022 (22.0394)	360.46348 (17.98744)	366.07655 (13.12525)	359.97183 (16.61746)	362.77837 (14.2789)
Basauri	624.46693 (45.5233)	628.30846 (44.06863)	613.71966 (42.94466)	643.46297 (36.24636)	636.97854 (33.46346)	645.19877 (35.5462)	641.95656 (34.29668)
Baños de Ebro/Mañueta	524.9807 (48.52194)	528.65126 (48.0048)	537.78711 (46.01984)	546.09744 (41.09846)	547.43222 (38.98262)	537.64031 (41.23552)	538.3077 (40.20892)
Beasain	652.68559 (59.21951)	654.90775 (59.72098)	662.98466 (60.79333)	671.38931 (61.07504)	676.19348 (61.67045)	670.26935 (60.75569)	672.67143 (61.04826)
Bedia	727.60471 (33.52227)	725.87904 (34.41024)	768.88486 (41.53854)	739.22353 (29.56879)	765.28926 (39.15315)	738.74632 (29.56581)	751.77919 (34.28888)
Beizama	1238.4586 (165.1719)	1210.4727 (159.1788)	1229.1755 (162.117)	1250.551 (165.3888)	1262.7625 (168.2442)	1251.0493 (165.9671)	1257.155 (167.3915)
Belauntza	970.99537 (66.09672)	952.96748 (65.46744)	967.31214 (66.0241)	962.60623 (77.36522)	968.1082 (78.10811)	962.24888 (77.7332)	964.99986 (78.10236)
Berango	612.81301 (40.12607)	620.28369 (40.62321)	633.43933 (42.70859)	634.68912 (30.01251)	643.12978 (33.29218)	636.36969 (30.47192)	640.59003 (32.11084)
Berantevilla	384.76502 (17.06704)	371.82482 (16.02148)	398.84988 (14.5083)	387.82589 (22.73982)	397.1167 (16.67661)	395.28313 (18.13455)	399.92853 (15.20212)
Berastegi	665.8221 (67.13522)	667.97971 (67.17003)	685.68009 (68.32004)	684.00684 (71.01904)	692.53928 (71.40641)	683.42954 (71.11353)	687.69576 (71.30733)
Bergara	659.23115 (59.53336)	661.70876 (59.82321)	671.95243 (61.06889)	675.71233 (63.15387)	681.41373 (65.30292)	674.73432 (63.23432)	677.58502 (64.30231)
Bermeo	607.08662 (45.51863)	616.37994 (46.4223)	647.64356 (50.45508)	633.67661 (34.50388)	650.9705 (37.51686)	631.21394 (34.29203)	639.86089 (35.78431)
Bernedo	355.64537 (20.3301)	356.52832 (21.23835)	380.49997 (19.73349)	371.60152 (16.81063)	379.4496 (17.47984)	365.08125 (18.34301)	369.00529 (18.58761)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Berriatua	761.88851 (46.40307)	760.63515 (47.19471)	802.99035 (51.82096)	777.0442 (43.70034)	799.67018 (45.78629)	776.43367 (42.83271)	787.74666 (43.87718)
Berriz	665.83034 (44.04491)	670.48895 (44.08596)	703.69814 (49.4814)	686.91102 (31.42683)	707.53518 (35.20282)	686.55426 (31.28884)	696.86634 (33.15934)
Berrobi	734.2141 (48.25745)	735.58399 (49.89948)	743.95391 (49.75748)	746.92925 (53.0512)	749.68871 (52.41972)	743.52702 (52.23757)	744.90675 (51.92645)
Bidania-Goiatz	778.72645 (53.61732)	773.9387 (53.90429)	788.84614 (54.4129)	788.0567 (54.81567)	794.27034 (54.26991)	779.80637 (54.51807)	782.91319 (54.24164)
Bilbao	912.6795 (63.95481)	901.91004 (62.73843)	887.58051 (61.56448)	926.65759 (46.42912)	919.85245 (45.74985)	927.80955 (46.62461)	924.40698 (46.28903)
Busturia	711.87379 (55.26819)	716.06772 (55.35941)	755.94504 (59.1444)	734.34844 (46.33837)	754.66337 (48.60408)	732.17904 (46.27697)	742.3365 (47.40478)
Campezo/Kanpezu	415.33498 (29.0187)	423.02842 (31.19345)	439.20287 (28.26956)	440.99009 (18.14991)	442.76964 (15.35586)	437.62512 (19.20992)	438.51489 (17.88517)
Deba	662.38139 (65.29802)	662.55562 (65.16688)	671.75349 (65.50714)	679.25704 (68.04237)	682.99981 (68.09308)	678.46169 (68.61704)	680.33308 (68.64246)
Derio	614.69128 (44.76086)	614.08967 (44.20336)	619.93183 (45.64453)	632.77473 (36.9124)	637.0112 (38.47338)	632.73768 (37.43107)	634.85592 (38.25317)
Dima	815.81898 (72.72013)	811.8624 (71.20152)	853.29463 (77.52782)	838.8956 (52.2616)	863.94874 (58.50184)	841.13694 (53.11917)	853.6635 (56.22733)
Donostia / San Sebastián	705.19981 (62.9668)	700.26226 (62.37974)	686.95732 (60.73357)	716.41482 (67.22803)	708.69328 (65.06979)	718.49222 (67.42292)	714.63145 (66.34086)
Durango	593.60893 (42.54742)	602.11372 (42.5901)	611.40594 (46.57135)	616.12128 (31.58062)	625.94104 (36.66681)	615.36156 (32.47886)	620.27144 (34.9015)
Ea	817.85043 (48.54064)	815.04983 (49.57614)	857.86184 (52.45829)	833.55238 (38.896)	853.1041 (42.15431)	832.34962 (40.56194)	842.12548 (42.17831)
Eibar	657.40229 (59.79203)	659.64209 (60.0869)	661.64575 (60.79108)	673.42678 (64.65216)	675.18039 (66.05451)	672.00562 (64.36137)	672.88243 (65.04982)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation).

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Elantxobe	885.35727 (58.87616)	880.57006 (58.36639)	918.96284 (61.24663)	902.41734 (40.3371)	921.14422 (40.00071)	897.54942 (40.24097)	906.91286 (40.07427)
Elburgo/Burgelu	348.90355 (22.75083)	360.51933 (23.75085)	368.90028 (23.11223)	371.3441 (20.13607)	373.87906 (19.08324)	370.57865 (18.62307)	371.84613 (18.2516)
Elciego	566.23877 (31.26901)	568.72404 (31.5832)	574.40463 (29.65667)	577.13605 (32.69884)	576.85292 (32.95583)	568.21257 (32.65868)	568.071 (32.76365)
Elduain	940.61039 (63.08841)	925.36903 (62.4331)	948.6647 (64.75251)	943.79877 (62.68201)	956.4923 (65.32072)	944.78874 (63.2033)	951.13551 (64.52404)
Elgeta	651.72812 (57.52411)	654.02989 (57.77492)	668.18723 (59.53832)	665.41379 (63.7693)	673.48776 (66.36107)	655.92913 (63.20838)	659.96611 (64.49636)
Elgoibar	656.29837 (59.80132)	658.05167 (60.13034)	665.42861 (60.82915)	674.01482 (61.70168)	677.64906 (62.71276)	672.85577 (61.6764)	674.67289 (62.17463)
Elorrio	628.01024 (47.3563)	631.90026 (47.01352)	665.18247 (53.66995)	651.14576 (32.59657)	673.43768 (38.76791)	653.21366 (33.04726)	664.35962 (36.09921)
Elvillar/Bilar	527.31846 (46.80819)	532.41758 (46.19179)	541.03125 (44.55962)	549.15257 (35.68102)	550.91008 (35.04123)	540.55932 (36.1254)	541.43807 (35.835)
Erandio	621.3099 (42.75856)	625.86047 (42.75185)	637.48276 (43.41509)	643.42092 (27.67592)	648.89583 (28.05334)	645.52366 (28.20664)	648.26112 (28.40152)
Ereño	1574.9894 (119.715)	1533.2344 (116.2304)	1581.5516 (119.8348)	1581.1309 (77.60384)	1604.9611 (79.32904)	1571.3346 (77.50164)	1583.2496 (78.3553)
Ermua	669.02951 (43.71577)	673.80541 (43.98711)	689.07762 (45.48276)	689.30982 (33.58797)	697.01867 (37.4975)	689.16572 (34.3382)	693.02015 (36.30236)
Errenteria	657.74134 (61.22761)	661.50161 (61.90665)	664.31547 (63.21485)	675.90919 (66.11288)	679.35084 (68.07806)	673.93421 (65.54292)	675.65504 (66.50889)
Errezil	760.37845 (62.53)	758.66473 (62.82122)	775.22084 (63.36897)	776.28837 (61.7017)	783.73357 (59.5374)	768.76573 (60.54573)	772.48832 (59.46614)
Erriberagoitia/Ribera Alta	353.96696 (12.41024)	365.11556 (13.58247)	382.14838 (12.0745)	371.3107 (12.03821)	376.00388 (13.11561)	371.12487 (12.02179)	373.47146 (12.50249)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Errigoiti	1014.6209 (88.61998)	1003.638 (87.07901)	1048.4971 (91.67683)	1036.1264 (65.90152)	1059.5079 (68.53171)	1025.9087 (65.68153)	1037.5994 (66.99964)
Eskoriatza	658.00731 (60.89262)	659.81331 (61.01702)	672.14778 (62.15215)	675.04549 (61.28799)	680.60345 (65.967)	674.03292 (63.03099)	676.81189 (65.36483)
Etxebarri	619.76301 (45.37877)	627.85141 (45.37649)	628.95951 (44.89915)	642.97369 (34.26839)	643.32377 (32.87566)	641.29424 (34.08005)	641.46928 (33.37498)
Etxebarria	868.9474 (43.65606)	862.57795 (44.79865)	904.16829 (48.68657)	886.46723 (10.72468)	907.68528 (16.29616)	884.99122 (12.06822)	895.60025 (14.85166)
Ezkio-Itsaso	871.41987 (141.0642)	856.92019 (136.6981)	876.09604 (137.5)	918.89365 (90.88297)	926.61933 (91.23342)	918.77945 (89.66077)	922.64229 (89.83927)
Forua	704.97205 (50.65615)	708.24241 (51.15344)	744.90021 (53.29594)	726.45325 (40.69975)	742.33919 (45.35787)	725.7788 (41.9206)	733.72177 (44.2452)
Fruiz	809.07642 (44.31726)	806.39722 (44.94004)	841.33476 (47.63861)	822.79943 (35.5328)	839.27866 (39.7238)	812.14239 (36.02578)	820.38201 (38.13403)
Gabiria	769.59612 (63.14159)	763.57272 (62.85539)	779.37749 (63.71987)	775.53372 (72.14588)	782.66562 (72.85209)	776.86292 (71.9581)	780.42887 (72.3101)
Gaintza	1300.9811 (80.15469)	1270.5748 (79.33919)	1283.8387 (79.05518)	1276.8783 (96.40384)	1279.6513 (97.3577)	1266.9057 (95.18249)	1268.2922 (95.63982)
Galdakao	620.60762 (47.97563)	627.57363 (48.40905)	649.06773 (53.78949)	645.56 (38.62363)	661.61306 (42.10043)	643.86957 (37.45575)	651.8961 (39.08178)
Galdames	930.22107 (49.32257)	922.00257 (49.70833)	970.76525 (54.88524)	942.05153 (32.35268)	968.10132 (32.96708)	942.70079 (32.48606)	955.72568 (32.79244)
Gamiz-Fika	653.56135 (52.64924)	660.58285 (52.97961)	695.58841 (56.26367)	680.13349 (38.30291)	697.93698 (41.82502)	678.69296 (38.95986)	687.5947 (40.71373)
Garai	1087.6407 (31.01436)	1064.4507 (32.51465)	1106.7002 (36.16587)	1085.4545 (5.555457)	1105.8135 (17.24317)	1076.2397 (7.463268)	1086.4192 (13.53002)
Gatika	699.46145 (62.52228)	703.20944 (62.21443)	736.22181 (65.0387)	725.13176 (51.44377)	741.60464 (52.82394)	724.48338 (51.23606)	732.71983 (51.926)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Gautegiz Arteaga	792.78145 (51.22784)	788.91807 (50.90932)	829.29541 (54.10875)	809.68377 (34.80495)	829.84563 (35.70684)	808.5976 (34.80408)	818.67854 (35.25375)
Gaztelu	1210.4054 (114.8325)	1185.5841 (111.9841)	1201.611 (113.3272)	1200.3146 (131.3713)	1211.5392 (129.1119)	1200.0865 (130.6062)	1205.6988 (129.4728)
Gernika-Lumo	616.72389 (48.79612)	624.62363 (48.86723)	642.07429 (50.59593)	641.71012 (37.80186)	650.88256 (38.45363)	640.77712 (38.03247)	645.36334 (38.36066)
Getaria	650.87227 (66.62017)	648.11877 (66.69534)	653.03893 (66.15437)	670.67035 (64.9879)	671.28409 (64.71732)	668.8303 (65.32084)	669.13717 (65.22375)
Getxo	610.46222 (44.91244)	616.47104 (44.73315)	593.96694 (42.57035)	632.53485 (33.18161)	621.43397 (32.86869)	634.83193 (33.90245)	629.28149 (33.74181)
Gizaburuaga	1491.2976 (67.46029)	1452.3447 (66.72621)	1498.9613 (72.22155)	1478.9814 (52.66223)	1504.8831 (54.52551)	1476.9619 (51.73162)	1489.9127 (52.66223)
Gordexola	735.76516 (39.33456)	734.89599 (40.19381)	780.92068 (45.09827)	753.95301 (19.18674)	778.49616 (23.18517)	753.94113 (19.93286)	766.21271 (21.91832)
Gorliz	664.23949 (44.94062)	668.71393 (45.29754)	687.55182 (47.83421)	686.27785 (31.15594)	696.92743 (32.77516)	683.44101 (31.62798)	688.7658 (32.42845)
Güeñes	632.11314 (47.37548)	639.5299 (48.01706)	674.18539 (51.8736)	658.46071 (31.27944)	676.77244 (35.13887)	658.27018 (32.17664)	667.42605 (34.10226)
Harana/Valle de Arana	435.27915 (29.63202)	442.55687 (30.48979)	461.88934 (28.37128)	456.94608 (20.4403)	462.60611 (19.35822)	448.26392 (20.86547)	451.09394 (20.25014)
Hernani	644.29291 (56.51262)	647.84418 (57.18008)	656.88423 (58.32316)	659.49469 (63.73378)	665.05297 (63.97734)	659.96152 (63.20227)	662.74066 (63.32045)
Hernialde	912.92273 (65.52641)	899.94635 (65.16457)	912.70326 (67.25169)	911.40896 (74.61364)	920.22038 (77.12148)	911.2052 (74.70243)	915.61091 (75.95121)
Hondarribia	656.55341 (64.40942)	650.16507 (66.2282)	647.86398 (71.15486)	677.3867 (77.50826)	684.59019 (82.84995)	675.61122 (72.84939)	679.21296 (75.68106)
Ibarra	665.17734 (57.76171)	667.78191 (57.95507)	669.02936 (56.9341)	681.79457 (60.55955)	680.65222 (57.77988)	680.33454 (59.84813)	679.76336 (58.44582)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Ibarrangelu	1101.2908 (115.896)	1082.4043 (112.4086)	1126.7265 (116.0916)	1129.5104 (73.23409)	1152.4449 (72.76261)	1128.0088 (72.50479)	1139.4761 (72.25465)
Idiazabal	650.95569 (56.22083)	651.44522 (56.76477)	664.99201 (57.20013)	666.2162 (60.85548)	671.43047 (61.87555)	666.01957 (60.60782)	668.62671 (61.1212)
Igorre	670.49755 (43.10176)	675.50631 (43.7104)	706.14308 (48.24107)	690.83376 (35.51492)	708.90218 (38.11029)	690.56819 (35.20436)	699.6024 (36.47783)
Ikaztegieta	764.72332 (59.98433)	760.64407 (60.47052)	764.99728 (59.65193)	782.17925 (53.63483)	781.81555 (52.91633)	781.38231 (53.71797)	781.20046 (53.3553)
Irun	656.35034 (58.90617)	657.16096 (57.44632)	658.28168 (57.61091)	668.22689 (60.58957)	669.71142 (61.0296)	670.73276 (61.6557)	671.47503 (61.86933)
Irura	624.69816 (73.53329)	628.92293 (72.9017)	631.09197 (72.07382)	645.17422 (77.71453)	644.29209 (77.68309)	643.1048 (77.82211)	642.66373 (77.79563)
Iruraiz-Gauna	337.18783 (27.46968)	350.29459 (27.85224)	363.03976 (26.34355)	360.44906 (25.85844)	364.44381 (21.77231)	359.82157 (24.90619)	361.81894 (22.89518)
Iruña Oka/Iruña de Oca	381.90534 (27.97771)	389.73675 (28.01777)	402.66714 (27.64486)	404.78501 (13.32779)	409.6428 (12.65783)	405.20913 (13.20751)	407.63803 (12.87469)
Ispaster	909.23731 (47.23848)	902.69541 (47.93097)	946.6222 (51.92549)	923.89496 (24.04579)	946.68296 (25.82264)	922.46532 (23.72858)	933.85932 (24.61179)
Itsasondo	717.78215 (51.39439)	716.92908 (52.22231)	730.10233 (53.42675)	732.86456 (53.40155)	739.66022 (53.01951)	731.60363 (51.61837)	735.00145 (51.42629)
Iurreta	665.68324 (47.56968)	662.69239 (47.30539)	694.73519 (52.1702)	685.3954 (33.1734)	704.8343 (36.2957)	687.28115 (32.93708)	697.0006 (34.48332)
Izurtza	1189.1666 (31.92198)	1152.8022 (29.63101)	1197.3625 (28.85516)	1168.5406 (30.66912)	1193.1084 (27.76831)	1172.4891 (31.4701)	1184.773 (30.00591)
Karrantza Harana/Valle de Carranza	733.62559 (44.72166)	729.6325 (45.92123)	771.39538 (49.64201)	752.73415 (27.01515)	772.95991 (30.81205)	752.13628 (29.43015)	762.24916 (31.32847)
Kortezubi	992.28874 (60.15112)	980.48183 (59.62492)	1022.1784 (63.43586)	1004.2275 (38.68877)	1025.7767 (41.24238)	1007.4898 (39.49781)	1018.2644 (40.77325)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Kripan	594.29839 (41.29282)	596.61756 (40.34504)	607.85305 (38.68134)	612.45251 (22.4402)	615.5879 (20.93944)	604.2261 (23.67042)	605.7938 (22.91613)
Kuartango	414.03566 (23.47985)	430.76052 (25.00553)	464.44237 (22.8801)	438.39415 (19.77734)	450.89753 (16.44795)	435.83142 (19.10751)	442.08311 (17.38292)
Labastida/Bastida	604.99261 (41.91031)	605.54008 (41.88103)	614.75204 (40.41434)	623.29507 (29.26304)	625.06186 (26.781)	615.16543 (28.97338)	616.04882 (27.74367)
Lagrán	446.72672 (35.21816)	451.53789 (34.99644)	473.86403 (34.03687)	467.87048 (22.22615)	478.20686 (18.28213)	467.64533 (22.77051)	472.81352 (20.75795)
Laguardia	571.37923 (33.72381)	566.6808 (34.13227)	581.76535 (32.01677)	584.73271 (25.81859)	587.41848 (24.98186)	578.06984 (25.95121)	579.41273 (25.57458)
Lanciego/Lantziego	479.85143 (30.53577)	488.37789 (31.21044)	494.80633 (29.24349)	502.10907 (19.42898)	501.63927 (14.95402)	493.08599 (18.46989)	492.8511 (16.23697)
Lanestosa	990.24688 (75.76026)	975.73647 (75.30709)	999.92891 (76.02787)	1006.9969 (55.1114)	1015.3457 (62.47799)	1004.7618 (58.15134)	1008.9362 (61.85023)
Lantarón	354.04795 (27.61824)	366.04903 (27.87405)	377.19539 (26.38628)	377.57359 (20.3301)	380.31551 (21.41707)	377.03806 (21.6412)	378.40902 (22.15928)
Lapuebla de Labarca	482.08509 (29.23722)	489.67623 (30.7906)	491.84492 (27.46509)	503.08868 (24.14977)	498.21944 (21.02576)	492.88019 (23.71405)	490.44557 (22.18036)
Larrabetzu	714.1736 (51.11936)	714.84132 (50.78907)	752.06575 (55.48413)	735.78843 (32.02792)	756.88627 (34.78795)	734.49945 (32.6468)	745.04837 (34.03656)
Larraul	945.41812 (58.3364)	933.9953 (58.78767)	947.85666 (59.06455)	938.30785 (70.80884)	943.59293 (70.50637)	933.52093 (70.32523)	936.16347 (70.17123)
Lasarte-Oria	646.76255 (59.89981)	650.19669 (60.28527)	641.70621 (58.27255)	662.82792 (65.89817)	656.25463 (62.9119)	661.62413 (65.58392)	658.33748 (64.08112)
Laudio/Llodio	631.66405 (41.7508)	636.20925 (42.11987)	638.94571 (40.65761)	652.14579 (28.07837)	651.34999 (26.13205)	647.67381 (27.44516)	647.27591 (26.4582)
Laukiz	696.18303 (59.78339)	699.13789 (59.54295)	723.89179 (61.93834)	721.11743 (46.99558)	733.78694 (48.89823)	720.17273 (47.20822)	726.50748 (48.16035)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Lazkao	637.19071 (54.47513)	641.2244 (55.48445)	647.25933 (55.15542)	654.05053 (60.5037)	655.37376 (59.65332)	652.60491 (59.73027)	653.26652 (59.30857)
Leaburu	838.92711 (46.70469)	830.29736 (47.61943)	840.47655 (47.5136)	839.8985 (54.71994)	842.99404 (53.30526)	838.8861 (54.14545)	840.43387 (53.43778)
Legazpi	663.35599 (60.20779)	665.95482 (60.40852)	679.66169 (61.91561)	679.27133 (64.73603)	686.55508 (67.38835)	679.05997 (64.76598)	682.70184 (66.08521)
Legorreta	657.93138 (60.41421)	657.64533 (60.89635)	668.62481 (61.19562)	673.30017 (66.89705)	677.40815 (66.79152)	672.56549 (66.28038)	674.61947 (66.22838)
Legutio	455.00037 (32.08615)	449.80607 (29.80966)	465.19784 (31.78174)	464.62954 (23.41602)	475.63482 (24.91404)	468.34034 (24.85343)	473.84298 (25.59929)
Leintz-Gatzaga	970.96151 (58.65787)	956.36895 (58.50896)	974.71595 (60.40511)	969.11928 (64.16724)	978.64351 (65.78617)	959.72066 (63.23504)	964.48277 (64.04805)
Leioa	604.06107 (40.90288)	609.32636 (40.72414)	589.81811 (37.31941)	624.72397 (28.77811)	612.75342 (25.96779)	625.12599 (29.31678)	619.14072 (27.88605)
Lekeitio	641.50694 (34.78021)	647.76001 (35.30223)	640.42115 (34.7286)	659.67926 (25.69012)	656.34819 (26.2917)	658.30373 (26.36055)	656.63819 (26.65597)
Lemoa	679.40001 (54.15639)	681.65833 (53.55416)	711.94649 (59.17366)	700.84654 (43.96257)	721.04316 (46.98643)	700.59781 (43.37527)	710.69612 (44.83805)
Lemoiz	742.51055 (57.93927)	744.11403 (57.5007)	779.3363 (61.56176)	763.76346 (44.40384)	783.85729 (48.93641)	760.44502 (45.0784)	770.49193 (47.32143)
Leza	665.17513 (43.25338)	659.11658 (42.94802)	671.04889 (41.00326)	681.61133 (25.39322)	682.31736 (20.12344)	673.1401 (24.53042)	673.49311 (21.88691)
Lezama	676.71827 (36.96588)	680.01494 (37.43651)	710.85747 (41.48936)	693.40099 (27.01056)	711.44042 (30.32873)	692.81008 (27.78885)	701.82979 (29.44503)
Lezo	659.4548 (53.70008)	656.80313 (53.38179)	660.92349 (53.10234)	669.11166 (58.86257)	669.78767 (57.33455)	669.01669 (59.12835)	669.3547 (58.36295)
Lizartza	734.73702 (57.40496)	734.52222 (58.2703)	748.45976 (59.32143)	745.16132 (66.61722)	752.11881 (66.95537)	744.50505 (65.88532)	747.98379 (66.0545)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Loiu	614.32607 (30.88689)	597.74478 (28.27684)	628.42036 (32.67773)	618.21966 (16.75588)	638.10047 (19.37607)	626.01886 (16.86867)	635.95926 (18.95856)
Mallabia	801.72393 (44.37992)	780.53075 (42.39308)	832.11979 (49.64061)	807.18487 (26.07293)	837.8464 (31.45052)	811.80566 (25.9264)	827.13642 (28.96899)
Markina-Xemein	648.87602 (50.31092)	655.10326 (50.70004)	695.80388 (55.84678)	673.68692 (39.62547)	696.21389 (43.45786)	672.13947 (39.60751)	683.40296 (41.51654)
Maruri-Jatabe	724.94875 (40.19104)	727.20807 (41.05223)	767.11581 (44.45588)	742.87207 (28.62721)	762.79318 (30.84982)	741.88448 (28.85576)	751.84503 (29.96651)
Mañaria	1003.6771 (73.01927)	990.03369 (71.52773)	1031.7368 (80.34065)	1017.6482 (50.59171)	1046.3962 (59.91973)	1017.2456 (51.78143)	1031.6196 (56.29519)
Mendaro	656.74366 (64.27314)	657.82897 (64.01328)	670.05998 (65.09428)	675.77949 (62.73996)	681.9939 (63.76223)	676.89189 (63.75258)	679.99909 (64.25973)
Mendata	1364.2721 (110.7497)	1334.9661 (107.3884)	1381.6076 (113.1207)	1371.247 (88.58418)	1397.9666 (94.96435)	1370.9207 (89.64308)	1384.2805 (92.83334)
Mendexa	1037.1839 (105.5321)	1022.6954 (102.286)	1059.5312 (107.2215)	1056.3153 (92.05972)	1077.5463 (95.41227)	1056.0646 (92.54835)	1066.68 (94.24568)
Meñaka	781.28135 (37.86418)	779.66057 (38.80173)	818.22174 (42.30807)	793.16416 (33.56995)	812.26943 (36.42167)	791.47316 (33.72969)	801.0258 (35.16257)
Moreda de Álava/Moreda Araba	538.98919 (35.17429)	543.18328 (35.27487)	550.55838 (33.67485)	555.70349 (28.79226)	556.89289 (28.39496)	546.1937 (29.12881)	546.7884 (28.93526)
Morga	1078.9693 (75.41294)	1062.5172 (73.74277)	1107.7929 (78.38902)	1086.1319 (63.95751)	1110.1835 (68.12838)	1076.2833 (64.79028)	1088.3091 (66.87761)
Mundaka	699.91998 (49.26035)	702.11997 (49.17633)	728.45993 (52.01775)	722.40723 (31.37332)	736.80579 (33.39484)	722.116 (31.65186)	729.31528 (32.66167)
Mungia	619.53323 (45.73053)	627.14379 (46.26919)	649.80351 (48.28835)	645.06361 (32.17889)	656.42961 (33.17187)	643.79862 (32.25317)	649.48162 (32.74818)
Munitibar-Arbatzegi Gerrikaitz	1253.4941 (72.06304)	1229.996 (70.84831)	1278.6476 (77.39716)	1253.2165 (61.09974)	1281.0861 (65.46104)	1250.8479 (61.07513)	1264.7827 (63.26101)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Murueta	1052.4641 (61.99809)	1030.9844 (61.27039)	1069.7967 (64.51305)	1056.2151 (48.91483)	1076.3319 (52.17633)	1056.7419 (49.48597)	1066.8003 (51.12319)
Muskiz	656.45716 (45.97754)	661.28506 (46.63459)	683.01613 (48.85292)	679.76679 (33.48912)	690.92463 (34.55661)	679.91855 (33.71675)	685.49747 (34.24978)
Mutiloa	954.15321 (60.64741)	935.98164 (60.01527)	951.57904 (60.45269)	956.35652 (56.5)	962.5104 (57.44831)	957.13345 (57.05329)	960.21039 (57.52709)
Mutriku	659.4948 (64.32652)	661.91226 (64.65631)	670.58716 (64.97128)	677.36163 (68.41289)	681.19239 (68.28046)	675.87768 (68.57786)	677.79306 (68.51213)
Muxika	773.58507 (38.66431)	773.63313 (39.31231)	817.75601 (44.97336)	790.92013 (16.70406)	816.26859 (20.70751)	790.43796 (16.44608)	803.11219 (18.39402)
Nabarniz	1575.0895 (105.9351)	1535.3201 (102.8051)	1580.4393 (108.061)	1571.4918 (82.76064)	1596.6214 (84.30132)	1561.4785 (82.2411)	1574.0433 (83.00874)
Navaridas	603.08118 (56.43252)	603.14747 (55.19745)	611.94861 (53.60595)	621.99027 (49.9577)	625.36538 (43.32684)	613.74034 (48.18147)	615.42789 (44.92497)
Oiartzun	651.91355 (60.69545)	647.4057 (60.33235)	661.50838 (61.70475)	666.97974 (61.32829)	674.54695 (62.87251)	669.22415 (61.74899)	673.00776 (62.52605)
Okondo	529.56044 (34.57547)	536.89563 (34.95695)	548.79287 (33.78097)	551.72882 (20.92394)	555.59879 (14.94525)	547.84346 (19.36185)	549.77845 (16.36742)
Olaberria	698.27937 (64.16518)	682.23691 (62.02089)	702.30815 (63.97893)	700.46973 (70.2893)	712.07102 (70.07531)	705.55612 (71.09816)	711.35676 (70.98576)
Ondarroa	640.72212 (49.46195)	646.69436 (49.37958)	666.37831 (51.35852)	665.10095 (36.00962)	675.46844 (36.06448)	663.89837 (35.95506)	669.08212 (35.98777)
Ordizia	638.55204 (50.14742)	640.74902 (50.84541)	638.14825 (49.74141)	652.07636 (55.79935)	648.78833 (55.08704)	650.83409 (55.49998)	649.19008 (55.14085)
Orendain	996.27342 (51.43022)	981.87994 (51.86777)	993.90269 (51.74409)	981.99473 (64.6809)	985.7838 (62.66261)	980.2007 (63.70628)	982.09524 (62.67812)
Orexa	1335.348 (123.2349)	1305.2378 (120.2762)	1320.3622 (121.7107)	1330.1235 (132.4862)	1338.2462 (133.1089)	1321.5892 (131.381)	1325.6506 (131.6934)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Orio	640.75842 (58.3121)	644.256 (58.90076)	646.8795 (58.70522)	658.25095 (62.97329)	659.58571 (59.50513)	657.43654 (61.9816)	658.10393 (60.27963)
Ormaiztegi	658.45821 (72.02672)	660.31643 (71.64336)	669.49156 (70.18229)	677.88607 (76.62427)	678.50205 (74.10218)	676.57952 (75.79816)	676.88751 (74.49763)
Orozko	719.49218 (51.78684)	720.22631 (51.2595)	763.11068 (57.61714)	737.27829 (43.54626)	763.02302 (47.41003)	737.66049 (44.23813)	750.53286 (46.16885)
Ortuella	617.88697 (40.0057)	622.61977 (40.24734)	625.24617 (40.6045)	638.98839 (27.69094)	640.75568 (29.53249)	638.48541 (28.09115)	639.36906 (29.00825)
Otxandio	748.2274 (59.81988)	747.79364 (59.04115)	782.72089 (64.88185)	768.90092 (45.71404)	790.51377 (52.19221)	768.43691 (47.16817)	779.24334 (50.38877)
Oyón-Oion	506.33111 (32.5845)	512.79249 (33.22427)	517.90605 (31.49723)	526.88455 (22.29154)	526.21264 (19.86161)	518.87025 (21.9599)	518.53429 (20.78401)
Oñati	655.18571 (63.41055)	660.3459 (63.57537)	672.46112 (64.97832)	673.83858 (66.18978)	680.33461 (68.91888)	672.6356 (66.79187)	675.88361 (68.14731)
Pasaia	656.65442 (64.11809)	660.39681 (64.01358)	658.20882 (64.80846)	676.09137 (65.29424)	676.88875 (66.01574)	673.13046 (64.75529)	673.52915 (65.09022)
Peñacerrada-Urizaharra	388.74239 (23.67615)	395.16494 (23.86575)	414.37174 (22.44965)	408.13662 (21.56377)	414.42004 (13.12371)	400.90431 (17.69403)	404.04602 (13.46899)
Plentzia	659.39804 (49.18081)	665.32243 (49.33078)	683.40839 (49.89366)	680.55409 (42.95356)	688.27809 (45.0812)	678.23366 (43.69529)	682.09566 (44.68938)
Portugalete	614.925 (45.6721)	621.54128 (44.83053)	589.05474 (39.70665)	636.18914 (33.62216)	617.14414 (29.3979)	637.01332 (34.22511)	627.49082 (32.02223)
Ribera Baja/Erriberabeitia	411.78634 (25.80561)	413.39774 (24.53365)	421.8343 (24.54556)	424.8545 (20.85281)	429.48252 (19.80376)	427.82646 (20.35735)	430.14047 (19.82226)
Samaniego	540.89051 (35.15969)	542.28551 (35.55671)	553.12614 (32.96632)	558.945 (26.39346)	558.76534 (22.59707)	550.89266 (26.00227)	550.80284 (24.10147)
San Millán/Donemiliaga	346.9623 (20.6795)	351.13134 (20.52273)	375.56892 (19.81954)	364.43245 (7.431909)	374.74245 (6.980951)	367.63933 (7.594981)	372.79433 (7.767011)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Santurtzi	607.31614 (43.73642)	605.21871 (53.63825)	599.99656 (41.4511)	646.38329 (53.30986)	621.73056 (29.27235)	635.788 (40.39304)	623.46163 (30.37978)
Segura	657.65472 (59.12864)	659.56423 (59.61077)	670.08033 (59.23497)	675.39632 (62.41644)	677.97555 (61.75916)	673.43362 (61.89423)	674.72324 (61.559)
Sestao	625.29715 (49.3287)	628.11158 (47.46908)	598.24316 (43.35498)	644.2987 (37.07248)	628.10319 (33.61183)	648.75008 (37.71291)	640.65232 (35.97454)
Sondika	644.41833 (40.9454)	637.29193 (37.40354)	657.65728 (42.47164)	653.66074 (23.30286)	670.94737 (24.85949)	660.12831 (24.59026)	668.77162 (26.03621)
Sopela	623.40716 (46.00047)	628.56291 (45.8816)	634.44973 (46.00703)	646.61975 (31.25015)	649.40902 (31.50497)	645.5642 (31.57888)	646.95884 (31.68985)
Sopuerta	670.17789 (52.22424)	675.18626 (52.20861)	717.98723 (56.77482)	694.31628 (36.23135)	717.44097 (41.27111)	694.28846 (37.62397)	705.85081 (40.14214)
Soraluze-Placencia de las Armas	665.21211 (59.05203)	668.35777 (59.62521)	676.15512 (61.26837)	681.73866 (63.50762)	688.22732 (62.85749)	679.36567 (63.31853)	682.61 (62.98437)
Sukarrieta	987.12972 (77.96684)	972.25271 (75.453)	1005.3058 (78.69975)	993.96065 (73.62209)	1012.1856 (71.56468)	992.05258 (74.03683)	1001.1651 (72.96783)
Tolosa	646.67397 (58.44106)	651.31089 (58.97233)	656.01571 (59.53362)	663.88061 (63.63198)	666.50537 (64.09062)	662.23385 (63.15298)	663.54623 (63.37736)
Trucios-Turtzioz	1241.7532 (123.2758)	1217.1884 (119.9058)	1263.0064 (123.9976)	1259.0986 (102.1429)	1282.5179 (103.015)	1257.4793 (102.7873)	1269.1889 (103.224)
Ubide	1424.1028 (125.224)	1389.011 (120.4901)	1427.7533 (126.11)	1427.0421 (109.9419)	1451.099 (114.1535)	1423.9741 (110.8951)	1436.0025 (112.9922)
Ugao-Miraballes	647.27855 (46.70954)	654.20483 (46.81347)	678.77386 (50.97833)	671.22761 (34.9704)	686.31547 (37.1524)	668.61327 (34.25418)	676.1572 (35.34621)
Urduliz	625.88185 (45.35069)	633.01857 (45.43779)	653.11541 (47.75412)	650.62982 (28.07502)	661.96374 (30.99772)	648.53189 (28.37397)	654.19885 (29.83888)
Urduña/Orduña	642.53729 (38.03568)	648.38632 (38.6637)	677.24872 (43.19177)	664.07977 (22.05821)	681.42952 (28.49684)	662.46266 (23.21436)	671.13754 (26.4488)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Urkabustaiz	424.65194 (29.7886)	433.61006 (30.57973)	447.06559 (29.57059)	449.66103 (13.93673)	453.00783 (12.2674)	447.26507 (14.20207)	448.93847 (13.35996)
Urnieta	666.01803 (66.51848)	665.42555 (66.45882)	674.15167 (67.89848)	684.372 (67.68958)	689.97989 (69.03867)	682.18687 (68.25986)	684.99082 (68.93141)
Urretxu	656.41391 (57.49543)	659.53059 (58.40858)	666.41054 (59.0112)	674.64584 (58.67657)	677.6423 (62.36482)	673.28185 (59.80553)	674.78007 (61.65291)
Usurbil	656.38417 (61.3348)	655.01564 (61.6294)	664.53449 (62.27401)	673.35082 (64.46619)	677.71195 (64.56181)	673.84432 (64.2155)	676.02488 (64.26489)
Valdegovía/Gaubea	369.77196 (17.62854)	376.97168 (16.40758)	396.1428 (17.62244)	380.37437 (19.33961)	387.11682 (21.40521)	382.22754 (19.35589)	385.59876 (20.37995)
Valle de Trápaga-Trapagaran	608.29982 (42.77536)	612.08882 (42.82671)	622.13159 (43.99372)	630.5701 (27.89739)	636.60023 (30.85372)	633.88871 (28.63607)	636.90378 (30.09251)
Villabona	658.2551 (61.24826)	661.60195 (61.60728)	668.26414 (62.57846)	675.6374 (65.26372)	679.79148 (66.59647)	674.98175 (65.32509)	677.05879 (65.98834)
Villabuena de Álava/Eskuernaga	535.37105 (32.06852)	535.59146 (32.4054)	548.0973 (29.89313)	547.25969 (32.82462)	548.92246 (30.25485)	539.17042 (32.50731)	540.0018 (31.25529)
Vitoria-Gasteiz	645.07167 (32.84454)	643.53734 (32.80111)	640.61892 (33.16832)	656.19558 (25.4838)	655.43171 (25.46042)	657.12345 (25.37722)	656.74152 (25.36382)
Yécora/Iekora	537.47202 (32.95252)	542.04062 (33.41649)	550.35561 (31.80505)	556.64042 (24.22214)	556.89297 (20.15823)	546.95526 (22.67977)	547.08154 (20.63939)
Zaldibar	665.80871 (55.40153)	669.85338 (55.06047)	698.9433 (59.78969)	690.62127 (41.15827)	708.5085 (45.04612)	689.66977 (41.30307)	698.61338 (43.22295)
Zaldibia	639.0869 (54.42289)	641.39906 (55.44589)	652.66128 (55.29308)	656.64208 (59.22274)	660.01951 (58.49401)	655.1284 (58.12768)	656.81712 (57.7672)
Zalduondo	579.57226 (36.76428)	582.15258 (36.43596)	594.37522 (34.5039)	592.47178 (31.92966)	595.18636 (35.46432)	582.48236 (33.39178)	583.83965 (35.17519)
Zalla	641.53512 (43.47613)	646.97681 (45.25291)	682.51225 (48.69929)	668.79851 (24.99302)	685.29671 (32.18999)	666.46043 (27.08351)	674.70953 (30.72177)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

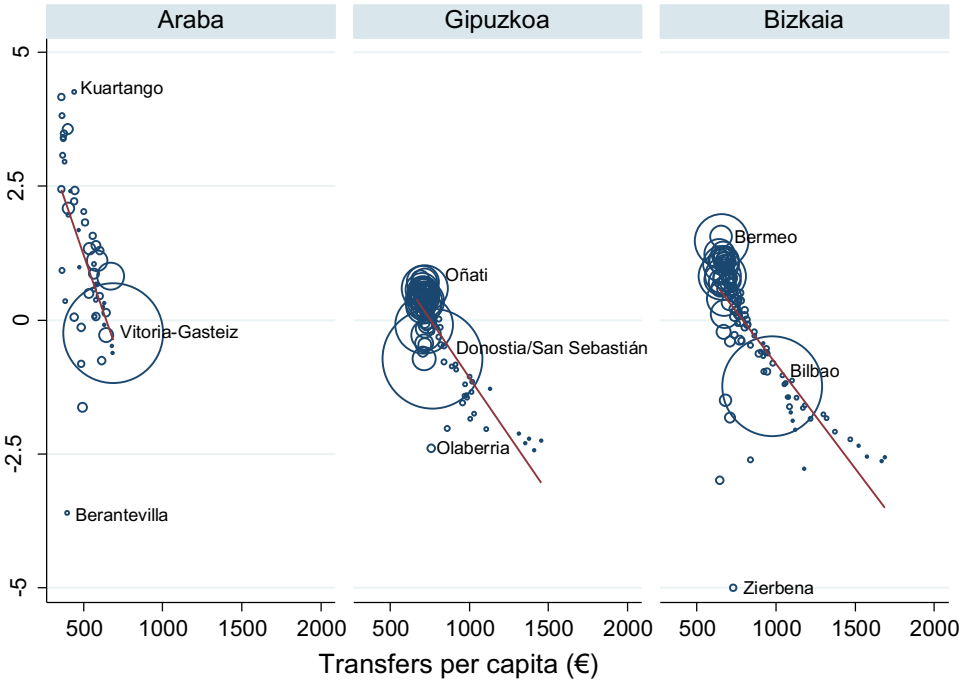
Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Zambrana	373.04419 (17.4246)	383.14781 (18.05508)	396.11862 (17.63404)	393.41048 (6.378029)	397.90764 (2.653301)	393.16514 (3.291447)	395.41372 (1.165602)
Zamudio	674.70772 (42.94338)	660.74871 (42.32599)	696.30776 (46.89082)	688.62095 (30.09076)	708.6605 (31.92137)	692.1848 (28.16834)	702.20458 (29.12412)
Zaratamo	697.6019 (36.15873)	692.1796 (38.04324)	738.21489 (42.71158)	713.8018 (37.14572)	735.03326 (33.68129)	712.92271 (33.53255)	723.53844 (31.47537)
Zarautz	650.27361 (61.01015)	652.06359 (61.36207)	648.54551 (60.6193)	667.71156 (64.64487)	665.14156 (63.78646)	667.83086 (64.36431)	666.54586 (63.94827)
Zeanuri	891.67452 (55.08151)	883.38911 (54.20307)	926.8403 (60.51839)	904.06114 (38.01184)	929.84624 (43.24025)	904.08443 (38.83764)	916.97698 (41.42279)
Zeberio	881.58442 (66.46081)	876.06735 (65.48222)	920.45713 (71.91873)	901.01882 (47.5008)	927.23699 (51.9868)	899.42235 (47.1631)	912.53143 (49.41147)
Zegama	654.38709 (61.55151)	653.92167 (61.4017)	671.34968 (62.61293)	667.98524 (67.73859)	675.77687 (69.18705)	667.47614 (67.95099)	671.37196 (68.67989)
Zerain	944.68749 (56.84231)	930.37164 (57.3691)	945.55299 (57.90671)	945.35518 (62.59723)	950.94378 (63.84223)	936.01575 (61.87076)	938.81005 (62.48473)
Zestoa	654.32892 (64.71339)	656.24402 (65.01056)	666.32742 (64.7299)	674.89892 (65.51689)	677.75032 (64.40724)	673.8863 (65.47612)	675.312 (64.91528)
Zierbena	690.51872 (53.94521)	659.62899 (47.37189)	685.111 (51.39056)	688.26332 (33.1792)	707.17336 (34.30769)	700.67636 (35.42495)	710.13138 (36.26203)
Zigoitia	453.95552 (31.3052)	454.30113 (30.57123)	471.46267 (30.78066)	467.95044 (25.30793)	476.24206 (27.31182)	468.74453 (26.67982)	472.89034 (27.69197)
Ziortza-Bolibar	1194.52 (98.20025)	1173.9305 (94.60901)	1211.6158 (99.9744)	1204.4774 (87.50756)	1228.09 (97.44254)	1201.7437 (85.73826)	1213.55 (90.2078)
Zizurkil	656.84644 (57.38307)	660.24677 (58.31347)	668.79838 (58.63007)	676.01807 (59.506)	679.35563 (59.67711)	674.82002 (59.25926)	676.4888 (59.34567)
Zuia	498.88435 (33.47986)	502.88465 (32.52686)	517.75499 (33.15776)	515.59025 (19.19164)	524.77871 (21.51641)	515.19938 (20.71723)	519.79361 (21.85548)

ANNEX III. Table C1. Transfers per capita in each of the reform scenarios (€) (2016-2019 unweighted mean & s.d.) (continuation)

Municipality	Current system	Local Sustainability OLS Index	Local Sustainability PCA Index	LSI OLS base + change	LSI PCA base + change	OLS Capacity + Needs	PCA Capacity + Needs
Zumaia	645.0962 (56.80483)	646.51777 (57.02964)	643.59988 (55.60886)	659.54587 (62.25452)	656.19738 (59.58649)	660.14348 (62.08288)	658.46924 (60.72598)
Zumarraga	656.75476 (61.54745)	659.93148 (62.24495)	666.8657 (62.74541)	675.93393 (63.20121)	679.17927 (64.55544)	673.45398 (63.83739)	675.07665 (64.52002)

ANNEX IV. Figures of baseline results and expenditure need reforms

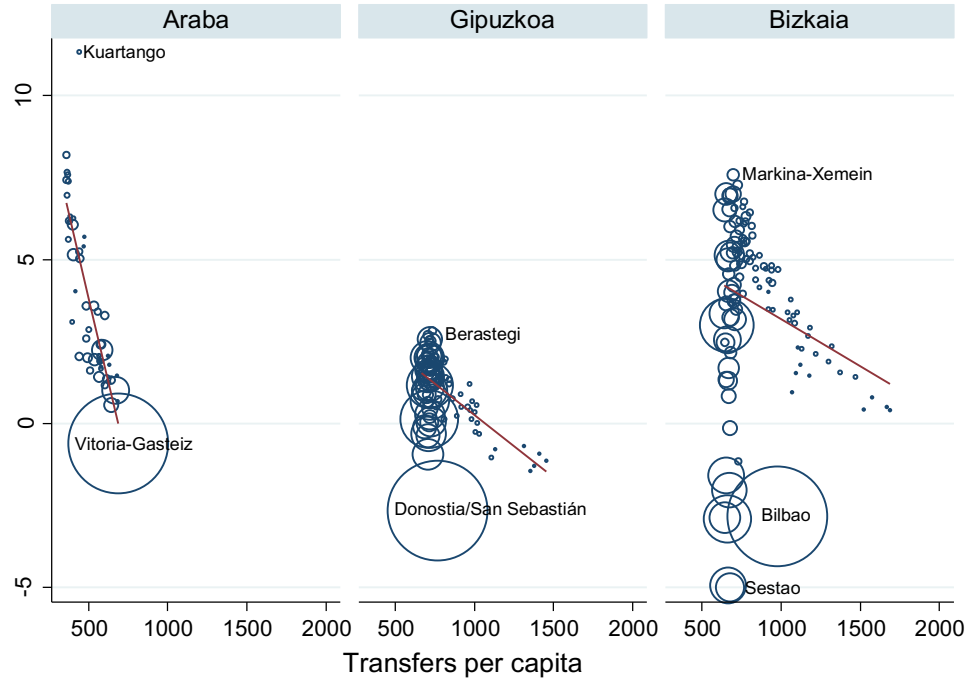
Figure D1. Change in per capita transfers (%). Current system vs. 5% base OLS-based Index (2019)



The area of symbol is proportional to population

Source: own elaboration.

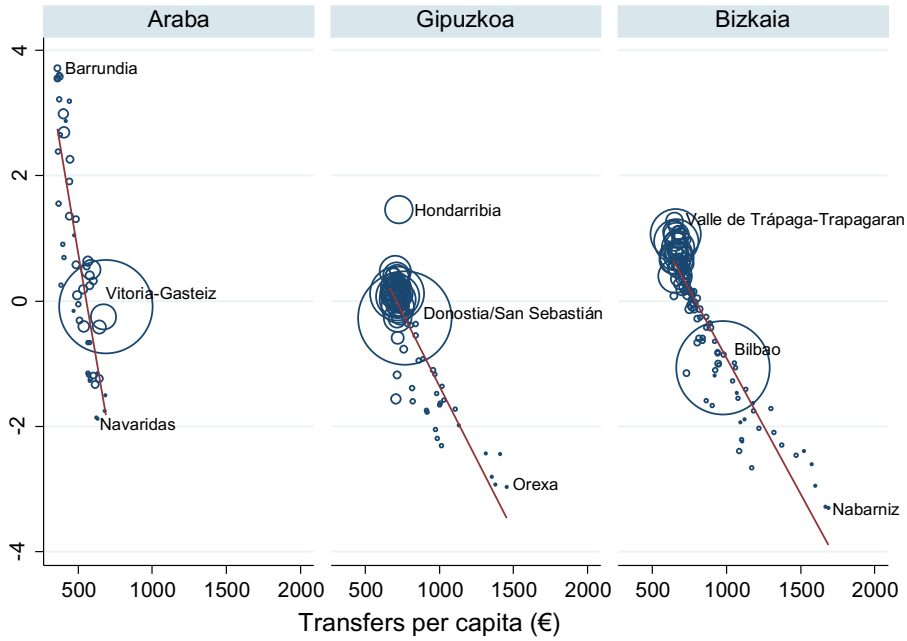
Figure D2. Change in per capita transfers (%). Current system vs. 5% base PCA-based Index (2019)



The area of symbol is proportional to population

Source: own elaboration.

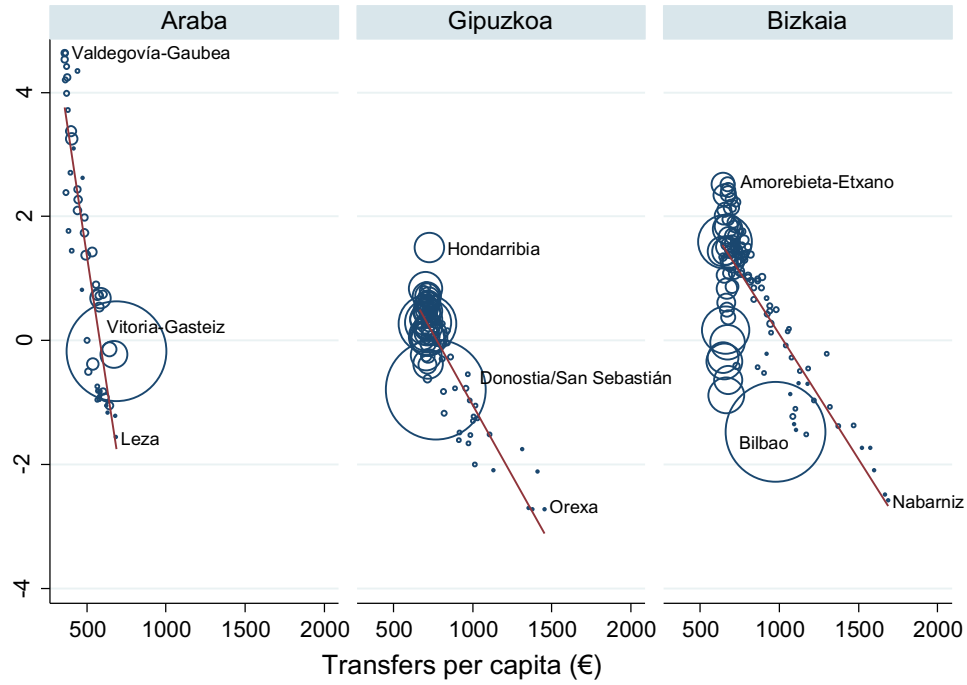
Figure D3. Change in per capita transfers (%). Current system vs. 2.5% fiscal capacity + 2.5% expenditure needs OLS-based Index (2019)



The area of symbol is proportional to population

Source: own elaboration.

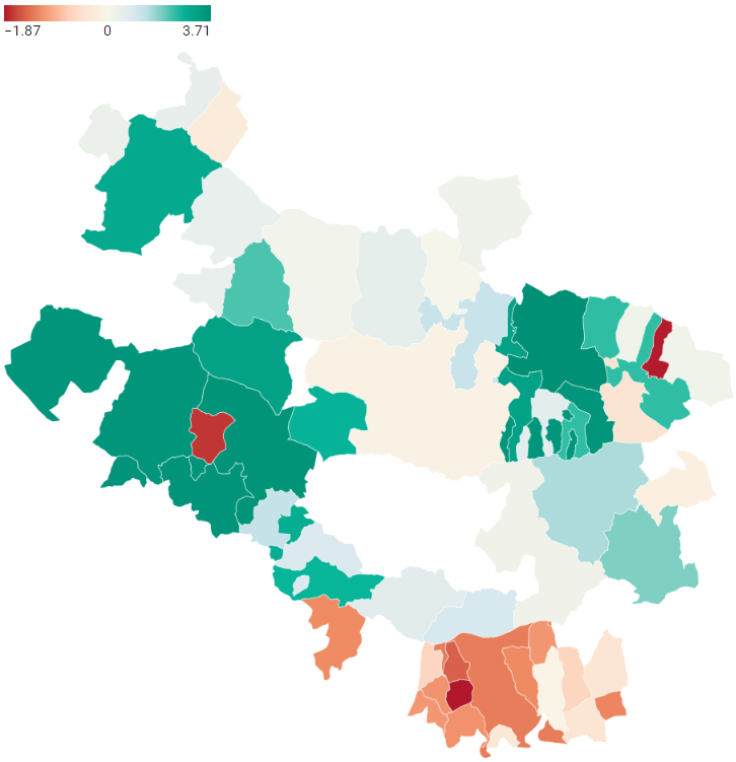
Figure D4. Change in per capita transfers (%). Current system vs. 2.5% fiscal capacity + 2.5% expenditure needs PCA-based Index (2019)



The area of symbol is proportional to population

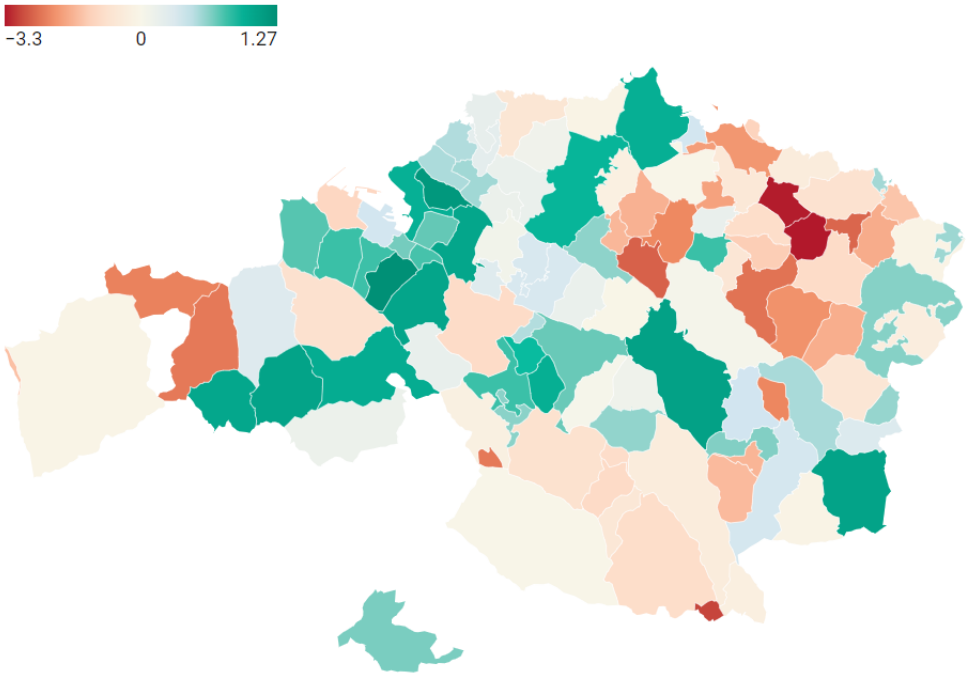
Source: own elaboration.

Figure D5. Change in per capita transfers (%). Current system vs. 2.5% fiscal capacity + 2.5% expenditure needs OLS-based Index (2019). Araba



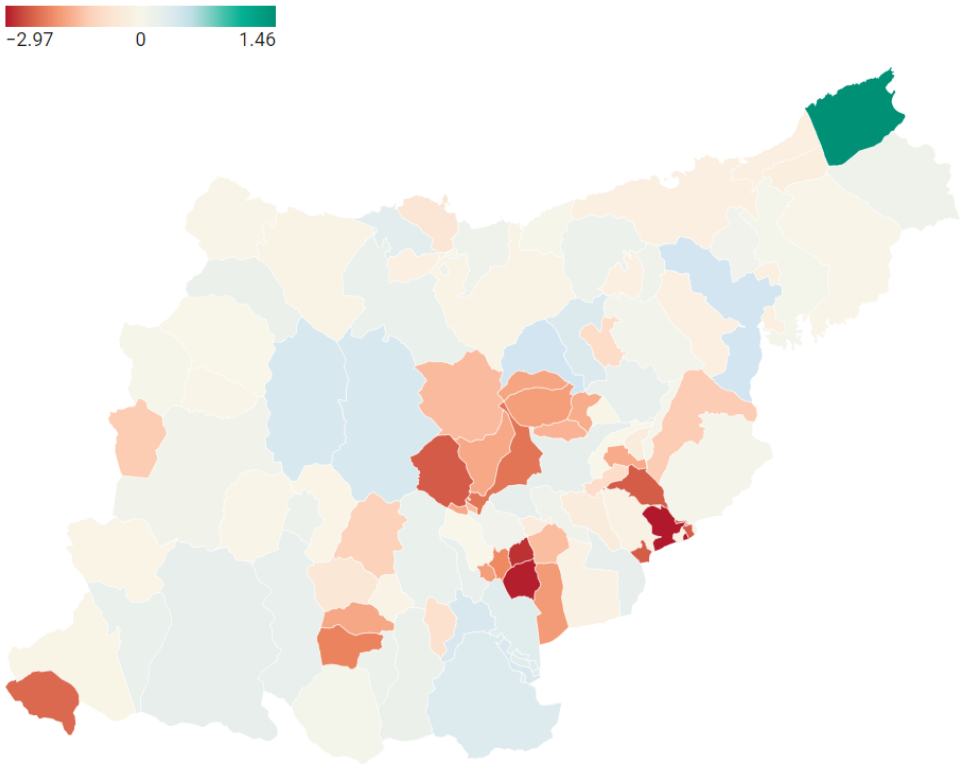
Source: own elaboration.

Figure D6. Change in per capita transfers (%). Current system vs. 2.5% fiscal capacity + 2.5% expenditure needs OLS-based Index (2019). Bizkaia



Source: own elaboration.

Figure D7. Change in per capita transfers (%). Current system vs. 2.5% fiscal capacity + 2.5% expenditure needs OLS-based Index (2019). Gipuzkoa



Source: own elaboration.