



ENHANCING WELL- BEING IN MINING REGIONS: KEY ISSUES AND LESSONS FOR DEVELOPING INDICATORS

ABSTRACT

This discussion paper has been prepared for the 3rd OECD Meeting of Mining Regions and Cities. The objective of this paper is to promote discussion about well-being challenges and opportunities in mining regions and cities and to identify a set of possible indicators to enable global benchmarking and analysis. The paper highlights the importance of well-being data for regional development and provides an assessment of wellbeing outcomes in mining regions based on the OECD's well-being framework. It then identifies key well-being issues particular to mining regions and cities and finishes by introducing possible new indicators to measure them.

1. Enhancing quality of life in mining regions – key issues and lessons for developing indicators

SUMMARY

This paper provides analytical background and input for discussion for the pre-conference of 3rd Meeting of OECD Regions and Cities in Skellefteå, Sweden. It proposes the development of a new set of indicators to measure well-being of mining regions and asks participants to provide feedback and share leading practice examples related to the well-being challenges identified.

- Mining regions face specific impediments and opportunities in generating well-being for their citizens due to the highly concentrated geographical nature of these activities.
- Mining regions and cities make important contributions to national growth and prosperity. The results from empirical analysis find that selected mining regions tend to do better in terms of material well-being indicators (e.g. income) and worse in well-being dimensions that influence quality of life (e.g. health).
- Literature review suggests they particularly struggle with the following key issues:
 - Income inequalities
 - Job opportunities for local workforce and skills mismatches
 - Pressures on public services and infrastructures
 - Volatility in housing prices, limited affordability or abandonment
 - Depletion of natural capital (degradation of air, land and water quality) as well as land use conflicts and health impacts that relate to this
 - Weakened social cohesion and limited civic engagement
- Increased well-being is needed to secure social acceptance of mining projects and to maintain regional competitiveness and future prosperity. Inequalities weaken social cohesion, increase economic vulnerability and reduce equality of opportunity in mining regions. The degradation of natural capital limits further future development and negatively impacts health. Further, good infrastructure and service delivery is need to attract and retain workers.
- Improving of well-being in mining regions calls for place-based policies that address these specific needs. Examining and monitoring progress in well-being dimensions provides an empirical basis to better tailor policies and, ultimately, contribute to more inclusive, sustainable regional growth.
- An adjusted set of well-being indicators is proposed, because the current OECD regional well-being framework does not sufficiently represent the key issues identified. The geographical scale (TL2 Level - typically States and Provinces) does not match the geographical scale of the problem, which is much more contained.

- This paper suggests three cross-cutting aspects in the development and analysis of well-being in mining regions:
 - The general **level of development** of a country or region, determines the overall standard of living and resources present. This influences the level of well-being and possibilities to improve wellbeing. At the same time, this also means that mining has a greater potential to positively contribute to well-being in developing countries under the right circumstances.
 - **Mining life cycle** is key defining aspect for levels of investments and population growth or decline, which affects job opportunities as well as pressures on infrastructure and public services. Further analysis is required to understand how outcomes and growth dynamics differ for regions at different points of the mining cycle.
 - The presence of **inequalities** between population sub-groups i.e. mining and non-mining workforce as well as Indigenous People and women, requires indicators sensitive to capture these issues. Analysing data on income, housing, education, civil engagement etc. should compare and quantify them. Further, regions with Indigenous populations should consider incorporating specific indicators that measure well-being as defined by Indigenous peoples.

Questions for discussion:

- What do you see as the most important issues in regards to the well-being of regions and cities specialised in mining and extractive industries?
- Are there any aspects missing from this preliminary analysis of wellbeing issues in mining regions?
- Do you collect data on these indicators in your jurisdiction? What are some innovative practices?
- How could the OECD present and analyse this data to make it meaningful for decision-makers in mining regions and cities?
- What do you think is the right scale to measure quality of life?
- Who has the policy levers to change performance on these indicators (local, regional, national or supra-national)?
- What do you see as the main policy gaps to improving well-being of people in mining regions and cities?

1.1. Introduction

The objective of this paper is to promote discussion about well-being challenges and opportunities in mining regions and cities and to identify a set of possible indicators to enable global benchmarking and analysis. It begins by identifying why a well-being framework is important to the development of mining regions and cities. This framework enables a focus on how to manage risks to local populations associated with a mining specialisation and build future resilience. The paper then presents and discusses how mining regions perform in relation to the OECD well-being framework. It finds these regions perform relatively strongly on material measures (income and jobs) but not on quality of life (e.g. health). It then presents the current indicator framework can be enhanced to capture the particular challenges and opportunities faced by mining regions and cities. An indicator framework to measure these issues, and to provide the basis for future global benchmarking and analysis, is presented. Finally, the paper identifies a number of cross-cutting issues that affect how regions may perform against this framework and the design of indicators, they are: the level of development, the point in the mining cycle, and socio-economic inequalities.

1.2. Well-being and mining regions

In many countries, mining is crucial to national economies. It can generate large benefits by making major contributions to national GDP, leveraging investments and creating high paid jobs. Globally, the share of value added of the mining and utilities sectors was 6.2 per cent in 2017 (UNIDO, 2018_[1]). Among OECD countries Australia and Chile rank highest on the ICMMs Mining Contribution Index¹. In Australia, average export contribution of minerals, metals and coal makes up 55 per cent of total exports and the mineral production value of GDP² makes up 11 per cent. In Chile, mining makes up 10 per cent of GDP. Mining is even more important to national economies in low and middle-income countries. In Botswana export shares make up to 92 per cent of total exports, production values of GDP reaches 53 per cent in Mongolia and mineral rents add up to 22 per cent in Suriname (ICMM, 2018_[1]).

Mining also has a strong sub-national dimension given that mining activities are highly concentrated in specific geographies. Regions and cities often benefit from mining through higher than average employment and income levels. Regional multiplier effects, such as increased spending on services due to higher incomes, are important factors for regional development (Reeson, Measham and Hosking, 2010_[2]). One job created in the mining sector can lead to the generation of one additional job in other sectors (Moritz et al., 2017_[11]). This indicates the potential for regional economic and social progress resulting from mining.

¹ ICMMs Mining Contribution Index, indicates the relative importance of mining to (182) national economies using a combining data on mining's contribution to countries' gross domestic product (GDP), export earnings and mineral rents that are paid to host governments (ICMM, 2018_[1]).

² Mineral production value expressed as a percentage of GDP in 2016. Note that it does not represent the contribution of mining to GDP – on average around a third of production value represents value addition to the national economy. ICMMs Mining Contribution Index, indicates the relative importance of mining to (182) national economies using a combining data on mining's contribution to countries' gross domestic product (GDP), export earnings and mineral rents that are paid to host governments (ICMM, 2018_[1]).

Resource specialisation exposes countries and regions to significant risks. Risks include external shocks through price volatility and lack of diversification, Dutch disease effects and environmental impacts. These can create large costs for communities, who sometimes only receive limited benefits. Many of these effects have a strong spatial dimension and constitute themselves as negative externalities around and in close proximity to mining operations. Key issues include:

- Income inequalities between population groups;
- Limited job opportunities for local workforce and skills mismatches;
- Pressures on public services and infrastructures;
- Volatility in housing prices, limited affordability or abandonment;
- Depletion of natural capital (degradation of air, land and water quality), land use conflicts, health impacts; and,
- Weakened social cohesion and limited civic engagement.

On top of that, global megatrends including climate change, ageing populations, digitalisation and automation generate particular challenges for well-being in mining regions. For instance, regions specialised in hydrocarbons will face the challenge of transition and diversification towards a climate-neutral economy. Further, regional mechanisms to retain attract and upskills workers will need to be adjusted in light of digitalisation and automation in the mining industry.

In response to these challenges there is increasing recognition that the extraction of natural resources needs to generate improved and sustainable well-being for mineral and energy producing regions and cities. If local communities do not benefit from mining activities through better economic opportunities and quality of life, it will undermine their support for mining and extractive activities, and increase adjustment costs when resources are depleted.

Apart from social acceptance and value-sharing, increased well-being also has a regional development dimension. Standard economic measures (GDP, wages, employment) do not fully capture what people value, how the benefits of growth are distributed, or impacts on the environment. Uneven distribution of wealth and quality of life weakens social cohesion, increases economic vulnerability, limits social mobility and reduces equality of opportunity. The degradation of natural capital limits future development possibilities. It is important for mining regions to ensure good conditions and opportunities for people living or growing up there, in order to build future competitiveness and prosperity. Examining and monitoring progress in different well-being dimensions can enhance citizens' quality of life and, ultimately, contribute to more inclusive, sustainable regional growth.

Place-based policies are an effective tool to address a variety of economic, social, demographic, institutional and geographic conditions specific to regions. In contrast to structural policies, they focus on challenges and opportunities specific to territories and aim at ensuring that sectoral policies, from transport to innovation and health, are integrated with each other and meet the specific needs of different regions (OECD, 2019^[5]). To better tailor regional development policies to the needs of mining regions, well-being challenges need to be better understood.

The assessment of local socio-economic well-being is quite complex and knowledge of how and if mining activities translate to economic and social benefits for citizens, especially on the local level remains largely ambiguous. Results from previous studies vary largely. They use different indicators and geographical scopes for their analysis, which are not comparable or useful for benchmarking (Hajkowicz, Heyenga and Moffat, 2011^[12])

(Noronha and Nairy, 2005_[13]) (Mancini and Sala, 2018_[6]). Nevertheless, previous studies provide a useful starting point for developing a more comprehensive framework for assessment. They also help to identify aspects that are relevant when seeking to assess well-being in mining regions across countries.

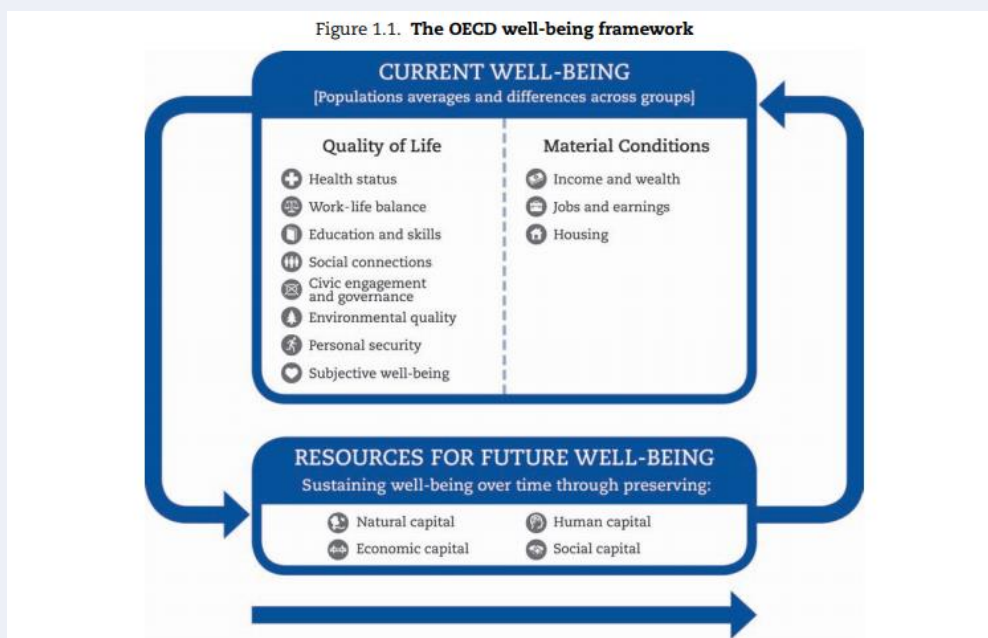
1.3. The OECD well-being framework

Following the global financial crisis in 2008, the global community changed its approach to measuring economic and social performance complementing traditional measurements of economic development based on national accounts with measurements capturing dimensions that matter to people's life. In 2011 the OECD developed a new framework to measure well-being (Stiglitz et al., 2018_[11]) (OECD, 2017_[10]).

The OECD's well-being framework measures whether, where and how life is getting better for people and what matters most in people's lives to ultimately better guide policy-makers in their decisions. Using various national and international initiatives for measuring the progress of societies it reflects emerging international consensus that outcomes, which contribute to people's well-being include income, jobs, housing, health status, skills, the environment, governance and personal safety as well as more experiential elements of life, such as social connections, work-life balance and subjective well-being (OECD, 2017_[3]).

The OECD well-being dimensions are categorised as material (e.g. income, jobs and housing) and quality-of-life (e.g. health status, social connections and environmental quality). In addition, four stocks of resources are identified to sustain those outcomes for the future. The resources focus on the broader natural, economic, human and social systems that embed and sustain individual well-being over time, they include human capital, social capital, natural capital and economic capital (see Box 1.1) (OECD, 2017_[3]).

Box 1.1. The OECD approach to measuring well-being



Sources: OECD (2017), How's Life? Measuring Well-Being, <http://dx.doi.org/10.1787/how-life-2017-en>

Overall, the framework operates along four main features. Firstly, the approach is people-centric, putting individuals and households at the centre of this assessment. Secondly, it focuses on well-being outcomes rather than inputs needed to deliver these outcomes (educational attainment in comparison to schools present). Thirdly, it measures objective and subjective outcomes using third party observations to capture life circumstances as well individual experiences to reflect inner states and fourthly, considers different well-being outcomes for different population groups investigating disparities occurring due to age, gender, education and income recognising that national averages disguise a great deal of variation (OECD, 2017^[3]).

One of the greatest strength of the framework is its ability to assess inequalities and their development overtime. Inequalities can undermine long-term economic performance at a national and sub-national level as they limit the ability of the population to fulfil their productive potential and improve their lives. Further, the impacts of inequalities across different areas such as income, education, health have been found to feed off each other and reduce aggregate productivity and growth. In addition, specific groups that might accumulate disadvantages and be disproportionately affected by inequalities (OECD, 2015^[5]) (OECD, 2016^[4]).

Addressing inequalities means countries need to understand differences for distinct groups. Inclusive growth policies refer to initiatives that help improve living standards whilst delivering a more even share of the benefits amongst population groups and places (OECD, 2016^[4]). Part of this is taking a close look at regional disparities and the need to adjust policy making to local circumstances to address geographically specific challenges.

1.4. Well-being and regional development

Places are essential in defining well-being. Where we live defines the air quality we breathe, the jobs we can find, the cost of housing and the availability of services. Immediate living conditions influence regional attractiveness and, consequently, define where people choose to settle in the long term. National averages are not sufficient to capture these immediate living conditions, as factors that influence well-being differ from one region to the next or even between communities. For instance, people in Hawaii (USA) generally live six years longer than those in Mississippi (OECD, 2014^[7]).

To improve well-being regional specific characteristics need to be taken into account. This is important as “spatially blind” policy interventions often do not reach their intended goals. For instance, as when looking to ensure that education and training match the local labour market needs, local conditions need to be taken into consideration. In addition, locally targeted policies can do more to reduce or remove the barriers to opportunity faced by disadvantaged groups.

The OECD’s analysis of well-being at the regional level provides a tool that allows policy makers to assess regional strengths and weaknesses, monitor trends and compare their outcomes to other regions, nationally and internationally (OECD, 2014^[7]). This way it helps to design policies that are responsive to people’s needs and experiences priorities measures that matter most and advance regional development in accordance to special characteristics.

The list of regional well-being dimensions including the available indicators is displayed in Table 1.1. The following section contains a preliminary analysis of how OECD mining regions perform in the well-being framework.

Table 1.1. Regional OECD Well-Being Indicators

Category	Dimension	Indicators
Material Conditions	Income	Household disposable income per capita (in real USD PPP)
	Jobs	Employment rate (%) Unemployment rate (%)
	Housing	Number of rooms per person (ratio)
Quality of Life	Health	Life expectancy at birth (years) Age adjusted mortality rate (per 1 000 people)
	Education	Share of labour force with at least secondary education (%)
	Environment	Estimated average exposure to air pollution in PM2.5 ($\mu\text{g}/\text{m}^3$), based on satellite imagery data
	Safety	Homicide rate (per 100 000 people)
	Civic Engagement	Voter turnout (%)
Subjective Well-being	Accessibility of Services	Share of households with broadband access (%)
	Community	Percentage of people who have friends or relatives to rely on in case of need
	Life Satisfaction	Average self-evaluation of life satisfaction on a scale from 0 to 10

Source: (OECD Regional Well-being Database, n.d.^[14])

1.5. OECD mining regions performance in the regional well-being framework – statistical analysis

1.5.1. Analytical approach

To better understand the relationship between well-being and mining regions, the analysis presented in this section adopts the OECD regional well-being framework to a few selected regions specialised in mining. The aim is to identify trends specific to mining regions and investigate how outcomes in different dimensions have evolved over time.

The analysis firstly identifies 40 OECD TL2 regions specialised in mining. Secondly, these regions will be analysed according to their performance in the well-being framework by presenting the Well-being spider of the average of the selected mining regions benchmarked to the average OECD TL2³ region and the OECD average. Then the section looks at the level and change in income, jobs and education of mining regions in comparison to the average level and change of the TL2 region. To identify regions that are specialised in mining two methods are applied. As a first step, all OECD TL2 regions are selected according to their sectorial employment share in industry and locational quotient (the ratio of the regional share in industry (excluding manufacturing) to the national share). Only regions with a location quotient higher than 1.9 are selected. A value above 1 implies that the region is more specialised in that sector than the rest of the economy. In a second step, desk research was undertaken to identify regions with a specialisation in industry (mining, energy and water) had current mining activities. Annex A provides a full list of chosen mining regions in the analysis.

³ TL2 is the OECD classification for large sub-national regions. They vary from country to country. They include states in the United States or provinces in Argentina. The international comparability is ensured by the fact that these administrative regions are officially established in countries.

1.5.2. Well-being in mining regions

Figure 1.1 assesses the current well-being in mining regions and how well-being outcomes differ in comparison to average OECD countries and TL2 region. Based on the data drawn from the OECD Regional Well-being database, the well-being outcomes in mining regions is mixed. For instance, mining regions have relative high well-being outcomes in dimensions such as income, housing and environment. In addition, residents of mining regions are relatively more satisfied with their lives than in other regions. Conversely, mining regions tend to have lower level of broadband penetration, social networks and health. As seen in previous sections, some of these outcomes are not surprising. Mining usually occurs in rural places that are more disconnected from services. In fact, the degree of rurality in these regions is 66% on average, which is higher than the OECD TL2 average of 45%. Counterintuitively to the well-being spider results, regions specialised in mining activities are at risk of being polluted. These results will be discussed in relation to literature on well-being specific to mining regions in Section 1.7

Figure 1.1. Well-being spider



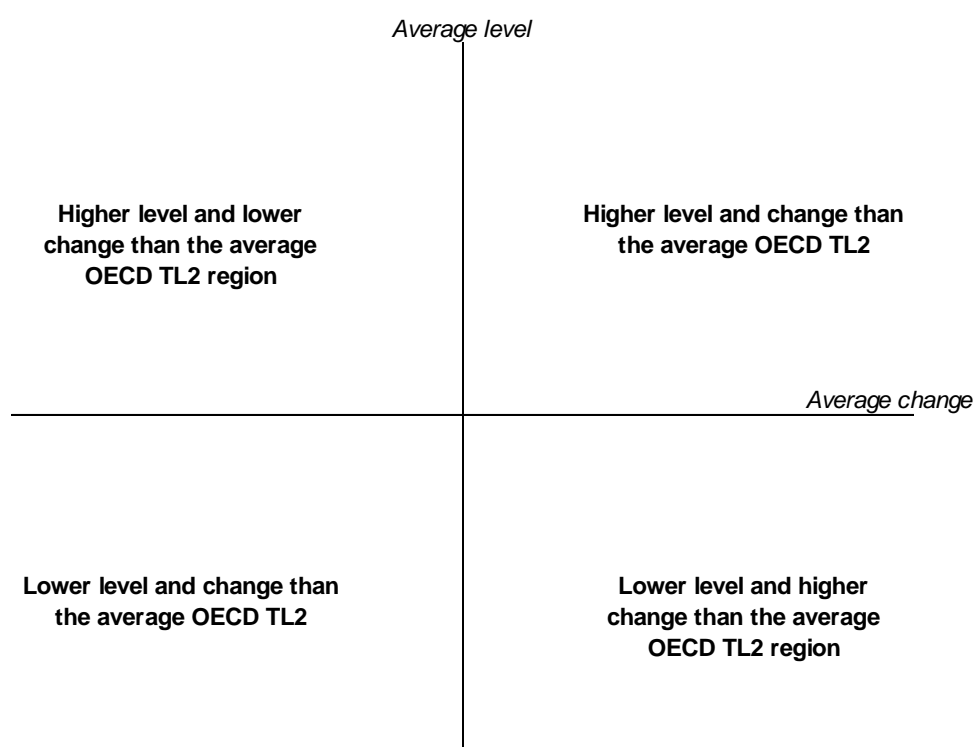
Note: OECD simple average = 100.

Source: OECD (2019_[16]) Regional well-being database.

Each dimension of the well-being framework is dynamic and changes over time. The framework presented below allows for the visualisation of the performance of each mining regions in selected well-being dimensions benchmarked to the performance of OECD average TL2 region (Figure 1.2.). For example, a mining region in the top-right quadrant

has higher level of well-being and greater change in 2000-2016 than in the OECD average TL2 region, whereas a region on the top-left quadrant has lower level of well-being and higher change than the OECD average TL2 region and therefore is catching-up to the average level. Regions in the remaining two bottom quadrants, both have reported lower change in well-being than the OECD average TL2 region. In the OECD context, regions in the bottom-left quadrant is of most concern, they have low levels of well-being and low levels of improvement.

Figure 1.2. Well-being in mining regions – a graphical framework to visualise the level and change of outcomes

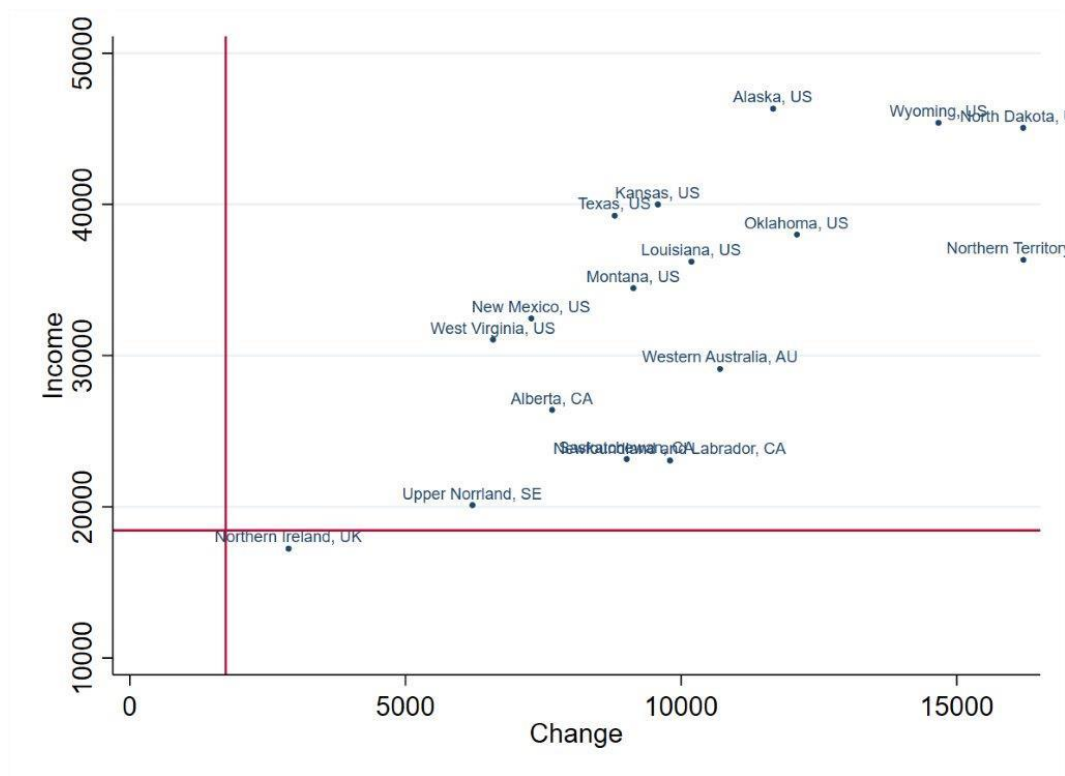


Source: Author's own elaboration.

Income

Jobs in mining industry are known to be well paid. The analysis conducted in this section compares average wages in region mining regions for mining regions vis-à-vis the rest. The analysis of levels and change looks at selected mining regions from higher income countries. About 41% of the mining regions comes from countries where the average household income is higher than the OECD average. The empirical evidence is in line with the finding in section 1.5, mining regions tend to have higher income than other regions that are not specialised in mining. Northern Ireland is the outlier regions, where the income is lower than the average OECD TL2 region. Over the time period, mining regions report of having higher change than the other OECD TL2 regions on average.

Figure 1.3. Levels and changes in income among selected TL2 mining regions, 2000-2016



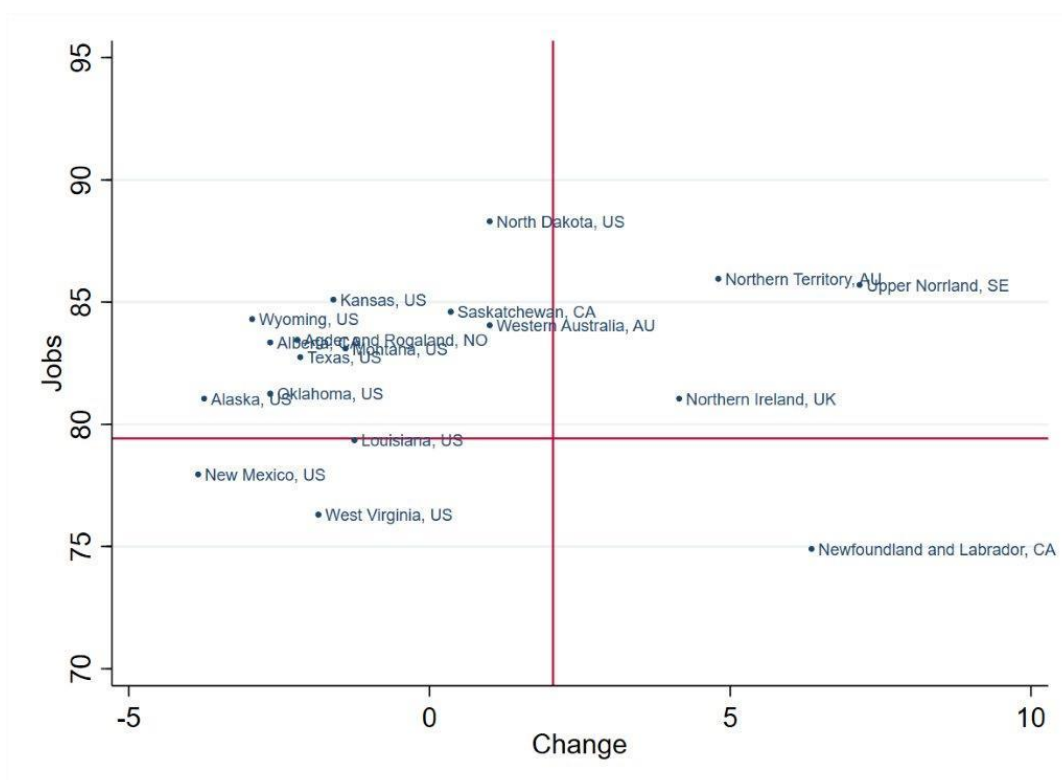
Note: Red lines presents simple average of OECD TL2 regions. The change refers to a time period of 2000 and 2016 for Australia, Canada, Sweden, the United Kingdom and the United States. The level refers to the year 2016.

Source: OECD (2019_[16]) Regional well-being database.

Jobs

Similarly as in income dimension, the framework on job performance looks at the relationship between the job dimension in mining regions and other TL2 regions. Generally, mining regions have high job performance. Most of the regions have jobs scores higher than the average OECD TL2 region. Despite the high performance in jobs, the evidence from change in jobs vary across mining regions in relation to the change in the average OECD TL2 region. As Figure 1.3 shows, the performance in jobs have diminished over 2000 and 2016 more than in the average OECD TL2 region. This trend may be explained by a number of factors including technological change, shifts in commodity prices and investment, and the overall job creation trends in OECD countries, which tend to favour services that are concentrated in large metropolitan regions.

Figure 1.4. Levels and changes in jobs among selected TL2 mining regions, 2000-2017



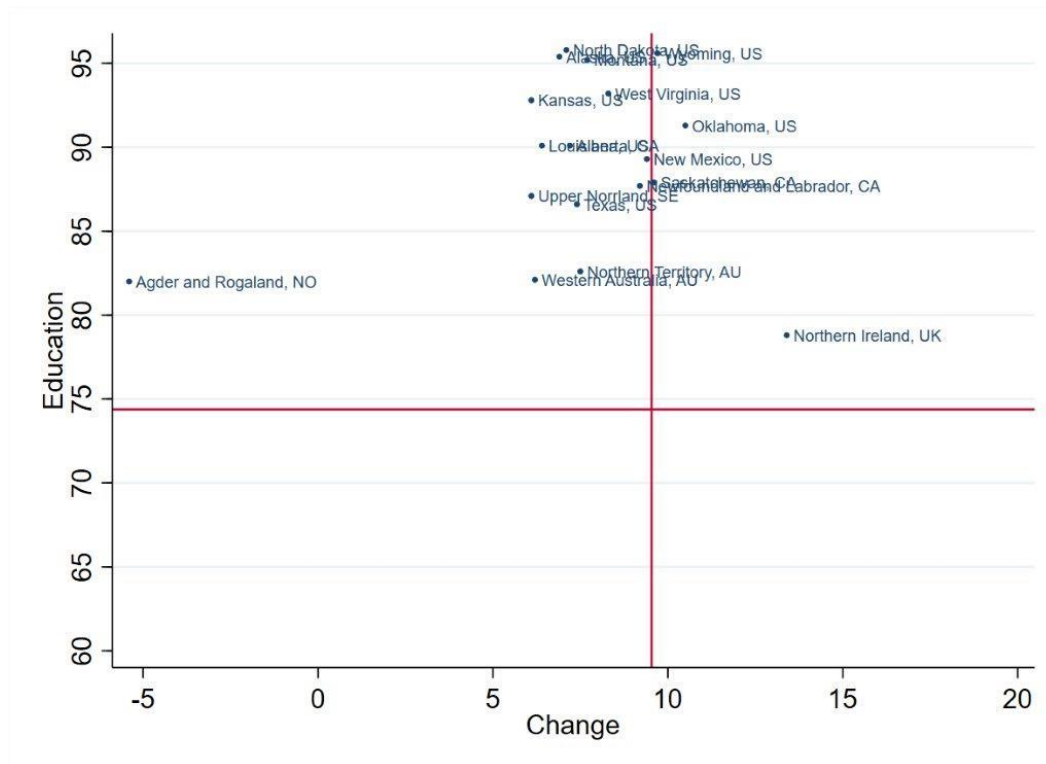
Note: Red lines presents simple average of OECD TL2 regions. The change refers to a time period of 2000 and 2016 for Australia, Canada, Kingdom and the United States; and 2000 and 2017 for Norway, Sweden and the United Kingdom. The level refers to the year 2016.

Source: OECD (2019^[16]) Regional well-being database.

Education

Education is an important enabling factor not only for individual well-being but also for the region. The framework analysis includes mining regions from countries where the household income is higher than the OECD average shows that these mining regions have a tendency to perform well in terms of education in comparison to the other OECD TL2 regions on average. All these mining regions had minimum of 5 percentage points higher educational level than the average OECD TL2 region. Although majority of these regions have improved over the time period, they have not been able to keep up the same change level as the other OECD TL2 regions. Northern Ireland in the United Kingdom and Oklahoma in the United States are the two mining regions where the change has been greater than the change in other TL2 regions on average.

Figure 1.5. Levels and changes in education among selected TL2 mining regions, 2000-2016



Note: Red lines presents simple average of OECD TL2 regions. The level refers to the year 2016. The change refers to a time period of 2000 and 2015 for Australia; 2010 and 2016 for Canada; 2000 and 2017 for Norway, Sweden and the United Kingdom; and 2000 and 2016 for the United States.

Source: OECD (2019_[16]) Regional well-being database.

Summary

The results of this section are not straightforward. Based on the current well-being indicators we cannot conclude that overall well-being in mining regions is better or worse off than in non-mining specialised regions. In quality of life dimensions (e.g. health), the performance is clearly lower than in other type of the regions and in dimensions which measures the material conditions (e.g. income and housing) mining regions perform fairly well. At some extent, the results indicates that mining regions perform relatively well in material well-being but they faces challenges in other areas of well-being, particularly in areas that influences the quality of life. The graphical framework showed that each mining region is different which makes the comparison difficult across regions.

Also, the methodology used in this section, however, is subject to the caveats. Firstly, the sample of mining regions does not cover and therefore presents all of the OECD mining regions. Secondly, the regions included in the analysis have specific regional effects such as size of the region, degree of rurality, type of mining activity and the stage of the mining activity that are not taken care of and that influence the well-being outcomes. Thirdly, the indicators used to measure well-being in mining regions are not quantifying the impacts of the mining activities. Lastly, well-being framework should ideally be adopted at a more disaggregated spatial scale to produce comprehensive picture of the impacts of mining on well-being.

1.6. Specificities for well-being in the context of mining

Mining regions can only live up to their potential in terms of socio-economic development, if policies reflect their place related specificities. Albeit limited, the above analysis points out specific characteristics in terms of well-being that are linked to extractions in mining regions (i.e. increased income levels and lower health performance). To deepen the statistical analysis the following section synthesises scientific and grey literature and identifies key well-being challenges in mining regions. According to the main themes present, a list of key issues is prepared. These key issues will then be used to propose adjustments to the existing indicator system on regional well-being to better capture the characteristics of mining regions.

Positive impacts of job creation and high income levels are key element of local support for mining activities –adverse effects need to be managed

Income and employment are two key drivers behind quality of life. High income and employment generally mean higher living standards, which allow people to fulfil their own ambitions and develop skills and abilities. Mining has been associated with higher than average income and increased employment. Yet, these benefits are distributed unevenly between population groups. Local governments in mining regions and cities can struggle with overcoming inequalities in income levels and employment, which affect and potentially hinder local growth (OECD, 2014_[9]).

Income inequalities in mining regions often relate to wage discrepancies between mining and non-mining workforce. As global players that compete for skilled labour, mining companies often pay more than local businesses or services. Consequently, other employers might struggle with competitiveness and can be driven out of the market. This reduces the local employment opportunities and economic diversity. Further, higher wages in the mining sector may reduce the spending ability of lower income groups as prices increase.

In other cases, jobs created do not benefit the local labour force, but rely on specialised outsiders. If workers are not permanently based in the community, income is often spent elsewhere. This leaves local communities without employment opportunities or revenues and, hence, the much needed benefit from extractive industries. Increasing trends of automation and digitalisation have a potential to add to this as they decrease the need for local labour force and allow economic activities to be detached from location (Moritz et al., 2017_[11]) (Reeson, Measham and Hosking, 2010_[12]).

Local job creation and good salaries are one of the key elements that determine the support for local mining activities. Mining companies increasingly recognise that a successful long-term business performance includes respecting societal needs and contributing to local economic development through local procurement of goods and services, creating employment, developing local skills etc. (Moritz et al., 2017_[11]) (Cosbey et al., 2016_[10]). In this context, multiplier effects that create additional employment are important to consider. The World Economic Forum estimates that mining is a relatively small direct employer, rarely accounting for more than 2% of jobs in an economy, while additional employment can range from three to nine times the direct employment (World Economic Forum, 2016_[16]).

Policies need to be designed to make growth more inclusive. To do that, regional measurements of income and employment need to capture potential wage inequalities, the diversity of the job market and the jobs created for local workforce. In addition, they also need to be sensitive to inequalities between other social groups such as Indigenous peoples

and women (for an elaborate discussion on inequalities see Section 1.6.4.). Further, policy makers need to anticipate potential changes occurring through automation digitalisation within mining regions and help policy makers to find the right responses as early as possible.

Dealing with fluctuations in housing affordability – balancing boom and abandonment

Adequate housing is key to people's well-being. It determines people's ability to meet very basic needs and is largely connected to other well-being factors such as health, environment and community life. For instance, it influences people's ability to engage in social activities such as inviting people. Housing also makes up a large component of household spending and can therefore determine the ability to spend on other necessities if prices rise. Hence, it is a key aspect with regards to attracting and retaining a skilled workforce, especially in remote areas, and local development (OECD, 2011_[15]) (Haslam McKenzie and Rowley, 2013_[16]).

An adverse effect of rapid growth and high wages in mining regions are housing shortages and reduced housing affordability. Relative rapid population growth, especially during exploration phases, often creates sudden pressures on existing housing stock and drives up housing and rental prices. Affordability problems are observed to have negative outcomes on social cohesion, reducing diversity and contributing to the marginalisation of low incomes groups. These are often pushed out of certain areas or forced to commute long distances. Indigenous and other vulnerable populations can be particularly affected, as they struggle to compete on the housing market due to racial discrimination and high levels of unemployment (Rowley, Haslam McKenzie and Birdsall-Jones, 2012_[17]). In other cases housing shortages can result in the provision of lower quality camp housing to accommodate temporary workers (Ivanova, Rolfe and Lockie, 2007_[16]).

Local policy maker's challenges to respond to housing pressures can be various. They include lack of sufficient available funding or capability to complete planning processes and or provide sufficient affordable housing programs, lack of free land to build on, infrastructure bottlenecks (for instance for sewage systems) as well as a lack of skills and workforce needed for construction. Limited responses often translate into a cascade effects that inhibit the attraction and retention of skilled workers for public service and other industries. Overall, this reduces the growth potential for small and remote communities (Province of Alberta, 2006_[16]) (Rowley, Haslam McKenzie and Birdsall-Jones, 2012_[17]) (Ivanova, Rolfe and Lockie, 2007_[16]).

In 2006 in Alberta, Canada, for instance, the oil sands development has led to acute shortages in affordable housing, which resulted in challenges for communities in attracting and in retaining public sector workforce. To offset high housing prices, the municipality has started paying allowances to attract people to work in public service (Province of Alberta, 2006_[16]). More recently, with oil prices going down, the housing market has seen increased vacancies and discontent about the increased reliance on temporary camps. Local communities criticise camp dwellers for not spending their money in the local economy and not having connection to local community. Consequently local councils in Alberta now prohibit new workers camps within 75 km of the urban centre in the hope of reviving the local housing market and local economy (Keller, 2019_[19]).

This example demonstrates the cyclical nature of the housing challenge and points to the fact that reduction of mining operations often goes hand in hand with the threat of decreased housing value and potential abandonment. This outlook is not favourable to attract

investment or families who might be looking to settle long term. Consequently, policy makers dealing with housing in mining regions need to consider multiple aspects that span from reduced quality of life of the mining workers that live in temporary housing to local inhabitants and other business that struggle with affordability or might fear the burden of dealing with devaluation.

To address these challenges, governments need to think about long and short-term policy implications that can help to be assessed with the right data about housing prices, available housing and quality of housing. In the short term, situation can improve through expanding the supply of housing, increasing land availability and private investment and building activity, financial support to attract non-mining workers as well as possibilities for low-income earners to buy first. In the long-term, planning for housing needs to incorporate the mining cycle, consider complementary aspects such as social implications and complementary policy sectors like infrastructure and services in order to broaden the demographic and economic diversity of mining towns.

Access to services— managing pressures and utilising revenues to attractiveness

Housing is not the only infrastructure experiencing increase demand with rapid population growth that often comes with mining. Other services like transportation, water, sanitation, education, health and ICT are equally needed to fulfil people's needs and wants. Depending on context, they range from basic services that are needed to ensure a decent standard of living to more advanced services that improve quality of life.

The OECD measures access to service according to physical, economical and institutional availability. Physical accessibility is defined as the ability to reach the location where the service is provided. Economic accessibility refers to cost associated with utilising the service (e.g. the costs of search, information and transport as well as the actual cost for the service). Finally, institutional accessibility to a service involves limitations such as laws, norms or societal values (OECD, 2014^[14]).

Developing services to meet the needs of a rapidly growing population growth can be of considerable cost for local administrations and lead to unmet needs. For instance, with population growth drug offences and crime rates increase and require more spending on training, staffing and equipment of local police forces (Ryser et al., 2019^[17]). In other instances, Fly-in/Fly-out (FIFO) workforces place an additional burden on local health services. Providing additional services can be difficult to handle for municipalities if they receive funds according to residential populations, because this calculation does not reflect the actual needs present due to temporarily present workers (Commonwealth of Australia, 2013^[23]).

In other cases mining can contribute to increased service provision as economic growth leads to higher government revenues which can be spent on public services that increase liveability for instance through improvements on infrastructure and amenities such as roads, public spaces and recreational facilities (Ivanova, Rolfe and Lockie, 2007^[15]). It is important that these investments are carefully planned and sequenced in order to quality of life and make regions attractive.

Mining companies increasingly get involved in service provision for communities. This most notably happens when companies construct new towns for workers and families and act as private local authorities that provide and maintain infrastructure, housings and amenities. In more established and populated mining regions, increases demand and usage of infrastructure and services due to mining has resulted in discussions about mining

companies' duty to maintain these and where to draw the line between municipal and company responsibility (Cheshire, Everingham and Lawrence, 2014_[28]).

Specific challenges arise when responsibilities for service and infrastructure provision are unclear. For instance, industry might finance services such as sports facilities, libraries or community centres but leaved the management and maintenance of these services to local administrations without considering local capabilities to take on these roles (Cheshire, Everingham and Lawrence, 2014_[24]). Hence, it is important for companies not to bypass local authorities in decision-making. At the same time companies can provide a useful partnership in cases where public capacities are limited. In order to ensure that service delivery is designed in a way that actually contributes to quality of life and attracting workers in the long term, strong cooperation between stakeholders is needed.

Health in mining regions is impacted through environmental and non-environmental exposures

Health is essential for life. It is also essential for achieving other well-being dimensions as it defines people's ability to work and generate an income as well as participate in education, social life and civil activities (OECD, 2011_[15]).

Reduced environmental quality caused by mining activities can have an impact on health of local residents in mining regions through air, water, soil and noise pollution. The UN estimates that metal extraction alone is responsible for 39 per cent of PM⁴ health impacts. Impacts largely depend on the type of material that is mined. For instance, coal mining is associated with increased risk for lung cancer, non-cancer respiratory diseases, cardiovascular disease, kidney disease, depression and poor birth outcomes (Hendryx, 2015_[25]). Further health issues affecting community health can be linked to the processing of minerals, for instance, in smelters (Stephens and Ahern, 2001_[25]). Increasing environmental protection and safety standards in mines are significant for the reduction of environmentally related health issues.

Non-environmental exposures are also important for community health and include stresses related to mining disasters, closures or work patterns (Stephens and Ahern, 2001_[25]). In past years, work patterns in remote mine sites have increase the use of fly-in/fly-out operations. This means that companies do not build mining towns but workers temporarily live close to the mines, work on block shifts of 12 hours and leave again for several days of break (Ivanova, Rolfe and Lockie, 2007_[17]). This model has been reported to cause problems for mining employees and their families. Impacts include greater alcohol and drug abuse, mental health issues, fatigue related injury, family violence, break-ups and reduced community involvement (Hajkowicz, Heyenga and Moffat, 2011_[13]) (Haslam McKenzie, 2010_[24]).

Education and skills –fit for the future

Individually, education influences well-being by being an important aspiration for people and contributing to higher income and better health status. Socially, it contributes to less crime, more civil engagement and less need for social assistance (OECD, 2011_[15]).

⁴ Particulate Matter (PM) health impacts are cardiovascular and respiratory diseases caused by fine primary particulate matter emissions or secondary particulate matter, which is formed from precursor gases transformed to particulate matter in the atmosphere (SO_x, NO_x, ammonia). (UN Environment, 2019_[34])

Education and skills training aimed at building a local skilled workforce is key to support regional employment in mining regions. Mining companies often struggle to find skilled workforce for their remote operations, as local work force might be small or does not possess the skills and qualifications needed. Following, mining companies poach workers from other local industries or try to attract workers from outside the region. This in turn, can create further skills shortages in the public and private sector and contributes to income inequalities described above. In other instances, companies address skills shortages through training local staff and set up or support local training facilities.

In light of technological changes towards increased automation and digitalisation, local future workforce is likely to be smaller, increasing flexible and high skilled, especially in information technology (World Economic Forum, 2015^[28]). Understanding these implications is important for communities. Potential implications include fewer jobs and different options to attract and retain workers. Estimates for the losses in operational jobs in areas such as drilling, blasting, train/ truck drivers rank between 30 – 40% and up to 75% for operators of mining equipment (Ramdoo, 2018^[30]).

To offset the risk of automation, investment in education is key for mining regions. Education offers need to be synchronised with market demands to ensure educational and training also lead to a job. Further, keeping in mind that mining is a time-limited activity, developing skills that are transferable across sectors is important as to ensure local population can build a long-term future in the region.

Safeguarding the environment is key for viable mining regions - today and in the future.

The environment is an essential component for local quality of life. Environmental quality such as cleanliness of air and water, but also the availability of green spaces and beauty of spaces impact individual health status (see above) as well as subjective life satisfaction (OECD, 2011^[15]) (OECD, 2014^[13]).

There is strong evidence that mining and extractive industries generate localised environmental impacts and externalities ranging from effects on land, water and air quality to noise, vibrations, wildlife extinction, aesthetic impediments (Noronha and Nairy, 2005^[8]) (Hendryx, 2015^[25]) (World Economic Forum, 2016^[16]). This needs to be carefully managed to ensure long-term quality of life and wellbeing for local residents. Most common well-being effects of environmental degradation caused by mining operations relate to health impediments, disturbance of residence as well as to other livelihood activities dependent on natural resources. For instance, significant use of water in mining activities, such as copper and gold, can create conflicts with agricultural businesses, particularly in remote areas, which may lack the necessary infrastructure. In addition, wastewater and runoff from dumps find their way into rivers and streams that contribute to water pollution that affects suitability for drinking and usage in agriculture.

Across OECD countries, mining and extractive activities are regulated closely to reduce environmental risks and impacts such as the erosion of soil, sinkholes, and the contamination of soil and water. An essential aspect of this are Environmental Impact Assessments (EIA) that aim to identify potential effects and damages caused by developments and help to foresee costs, losses and consequences. Despite this, some mining regions past mining and extractive activities have left legacy costs, which are costly to ameliorate. For instance the remediation in Saxony in Germany amounts to € 65 billion and a project to relocate and confine uranium mining waste in Colorado is budgeted with around 1 billion USD (NEA/OECD, 2014^[23]). If these costs are not defined in agreements

with companies then the cost burden can fall to public authorities, or be resolved through costly litigation.

With increased valuation of environmental preservation, ecosystem services and public health and life quality aspects, mining companies and governments are pushed to make mining more sustainable. Local measures include greater focus on more efficient use of resources (using less water, power and land) as well as greater focus on starting remediation processes alongside mining operations and reusing and recycling commodities and metals. Important is that measures to prevent, mitigate and offset impacts cover the entire life cycle of a mine – from exploration to post-mine rehabilitation (World Economic Forum, 2016^[16]) (World Economic Forum, 2015^[29]) (Carvalho, 2017^[24]).

Box 1.2. Risks for future well-being: Safeguarding Natural Capital and ensuring a Just Transition

Besides measuring current states of well-being and investigating the effects of mining on people's lives today, it is equally important to consider potential risks and stores of value for future well-being. The OECD measures capitals needed for future well-being using indicators that take stock of natural, human, economic and social capital, as well as a range of relevant flows (e.g. investments, depletions, emissions) and risk factors that may affect how these stocks evolve. For the indicators related to natural capital see table 1.3 (OECD, 2017^[11]).

Table 1.2. Natural Capital

Type of capital	Indicators related to the "stock" of capital	Indicators related to flows (investment in, and depletion of, capital stocks)
Natural Capital	Table C Exposure to PM2.5 air pollution*	Greenhouse gas emissions from domestic production
	Forest area	CO2 emissions from domestic consumption
	Renewable freshwater resources	Freshwater abstractions
	Threatened mammals	
	Threatened birds	
	Threatened plants	

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Source: (OECD, 2017^[11])

The weakening of natural capital, regionally as well as globally, poses a risk to future well-being. Rising sea levels and the increased frequency of extreme weather conditions, caused by global warming, make certain places increasingly inhabitable and threaten people's livelihoods. Further, the depletion of stocks like water and land, endangers the sustainable supply of food and freshwater and imbalances ecosystems that are needed for pollution breakdown, climate stability and recovery from natural disasters. To safeguard possibilities

for regional development in the future and to assure that future generations have the resources they need, natural capital needs to be preserved.

The current way of resource use significantly affects the natural capital available to future generations. Resource extraction is responsible for half of the world's carbon emissions and more than 80 per cent of biodiversity loss. The extraction and primary processing of metals accounts for 26 per cent of global carbon emissions (UN Environment, 2019^[34]). In the light of growing demand for minerals and metals – the world consumption of raw material is set to double by 2060- the extractive industry is required to contribute to the mitigation of climate change and safeguarding of natural capital.

Key mechanisms include reduced CO₂ emissions, more efficient energy use and the protection of biodiversity and land. One example for the reduction of environmental impacts in extractive industries is recycling. Reuse significantly reduces impacts by reducing the need for extraction and processing that are responsible for large parts of CO₂ emissions and energy use. At the same, it creates new economic opportunities. Especially metals lend themselves well to circular economy approaches, because they can be melted and reused indefinitely (UN Environment, 2019^[34]). Other approaches include the reduction of emission through the use of smart sensors that lead to greater operational efficiency by reducing energy and water consumption, and cutting the volume of waste generated (World Economic Forum, 2017^[35]).

The indicators in Table 1.3. provide an assessment of how natural capital is effected at the national level. At the regional level data is often more difficult to obtain. Yet, individual initiatives that collect data on local level exist. For instance, the [UK Government local authority and regional estimates of carbon dioxide emissions](#) tracks CO₂ emissions on local and regional level. This is important as it allows policy-makers and the general public to identify emission sources such as transport, industry and agriculture and view how emissions have changed over the past five years (UK Government, 2018^[36]).

Policies to decarbonise the economy and drive a sustainable energy transition entail the phasing out of certain carbon-intensive industries towards renewable and less polluting economic activities. This also has a social component, while this includes new labour opportunities, certain regions will be negatively affected and face significant transition costs (OECD, 2017^[36]) (UN Environment, 2019^[34]). Effective place-based regional development policies will be key to ensuring a “just transition” where regions can benefit from transition and manage associated challenges. This for instance can take the form of education and training programmes that help people adjust to the changing labour market.

Civic engagement and community life – building resilient communities

Civic engagement matters for well-being as it allows for expression of political voice and feedback to political leaders, essentially enhancing accountability and effectiveness of public policy. Further, civic engagement often goes along with contributing to community life which in turn allows for the development of a sense of belonging and development of trust (OECD, 2011^[15]). As social beings, interactions with family, friends and colleagues, provide people with pleasure and provide material and emotional support. Hence, frequency and quality of personal relationships determines quality of life (OECD, 2011^[15]).

Civic engagement and community life can be a challenge for mining regions. In the past, mining communities and governments have been criticised for their lack of consideration

for the needs of local communities' and people have increasingly asserted their rights to direct participation in decision making. To reduce conflicts and disagreement related to mining ventures, the concept of 'social license to operate' was introduced. Social license symbolises the broad approval and acceptance of mining communities' towards activities within their territory. Often these licenses are an opportunity for local communities to increase civic engagement, voice their opinions and influence development.

The increase emergence of Long Distance Commuting (LDC)⁵ is not beneficial to developing viable communities. People who do not permanently reside in communities have fewer incentives to engage in social or political community life. Studies investigating social effects of LDC in mining towns report increased segregation between mining and non-mining population as well as increased antisocial behaviour, crime rates and, low rates of community participation and limited sense of place attachment. Declined community engagement and voluntarism can effect community capacity to maintain service and program levels (Storey, 2010_[28]) (Haslam McKenzie, 2010_[25]).

Box 1.3. Collective Impact Model – the Port Hedland Collective

To improve outcomes for the mining town of Port Hedland, a town of 16,000 people 1,800 kilometres north of Perth in Australia, the Hedland Collective, applies a collective impact approach. It seeks to solve complex social problems related to being a remote mining community and to improve coordination and alignment among existing efforts. Formed in 2017, the collective brings together public, private, and not-for-profit organisations dedicated to work together on three key themes that were identified by the local community:

- strengthening local employment, training and business development;
- coordinating social services to ensure support for all community members;
- building and communicating community vibrancy and culture.

The collective impact model seeks to bridge possible silos and disconnects between stakeholders. It ensures that all participants work towards a common agenda and track the same measure of progress. A plan of actions ensures cross-sector alignment, allows for co-ordination of actions and lessons learned and ensures continuous communication to build trust and assure mutual objectives. To coordinate between participants a backbone organisation serves the initiative as a whole.

Source: 2nd OECD Meeting of Mining Regions and Cities, Presentation Hedland Collective

⁵ Workers who only reside in communities part-time, largely live in self-contained environment and work long hours.

Summary of key issues for well-being in mining regions and cities

Table 1.3. Key issues for well-being in mining regions and cities

Main Theme	Key Issue
Jobs and Income	<ul style="list-style-type: none"> • Creation of new jobs directly and indirectly (multiplier effects) for local workforce • Income inequalities between different population groups (mining and non-mining, Indigenous and non-Indigenous, men and women) • Changes in job structure due to automation and digitalisation • Decrease in competitiveness of local non-mining employers due to high wages • Income spend outside the region/city
Housing	<ul style="list-style-type: none"> • Volatility in housing prices (lower affordability creates marginalisation of low income groups or need for long distance commutes; sudden devaluation can cause abandoned infrastructure and deters investment) • Low quality camp housing that entail additional social challenges (i.e. segregation, drug use etc.)
Access to services	<ul style="list-style-type: none"> • Increased demand and costs for services due to population growth • Opportunity for improve service provision due to increased local revenues • Co-ordination between private sector and local governments for service provision
Health	<ul style="list-style-type: none"> • Health impacts through air, water, soil and noise pollution • Health risks related to occupations, disasters, closures or work patterns
Education	<ul style="list-style-type: none"> • Skills mismatch, between local workforce and industry needs • Change of skills and qualification needed do to automation and digitalisation
Environment	<ul style="list-style-type: none"> • Immediate, localised impact on land, water, air quality and biodiversity through pollution • Land use conflicts and threats to alternative livelihoods • Depletion of regional and global natural capital needed for future well-being (CO2, carbon sinks etc) • Local legacy costs
Social Connections and Civic Engagement	<ul style="list-style-type: none"> • Lack of civic participation in decision making about mine operation • Decreased social coherence and community engagement due to LDC

Source: Author's elaboration

1.7. Developing indicators specific to mining regions

To measure well-being in mining regions the existing OECD well-being framework needs to be adapted. The above literature review demonstrates that many of the challenges specific to mining regions are not, or only partially, represented in the data analysis. For instance, while the data confirms that income in mining regions is higher than in the average TL2 region, it does not take into account income disparities between specific population groups and does not reflect where income is spend. This way adverse effects that might be an obstacle to regional development opportunities stay uncovered. Further, findings in the literature review and data analysis oppose each other with regards to housing an environment. While our selected regions score higher in housing and environment than the average TL2 region, these emerge as key quality of life issues in the literature review.

The reason for this mis-match is largely linked to unsuitable indicators and the size of geographical areas covered. Many of the indicators of the OECD regional well-being framework are not sufficient to not measure the issues that were identifies in section 1.5.

In terms of employment for instance, only employment and unemployment rates are measured, yet it is key for mining regions to understand what kind of jobs are created, how the local population participates and the multiplier effects of mining. Similarly, also the indicators for housing need to be reshaped in a fashion that measures housing affordability and quality of housing available as mining regions. Other examples for readjustment include the measurements for accessibility of services, which does not account for the availability and distance of health or educational facilities as well as quantifying environmental aspects that extend beyond air pollution.

In addition, the specificities that are described in the literature review only affect a much smaller geographical area than captured by the TL2 level. Measurements for TL2 regions can cover very large areas such as Western Australia (2,529,875 km²) or Alberta, Canada (642 317 km²). Yet, problems with regard to housing affordability, air pollution or health are likely to be linked to mine site proximity. Averages across large regions are likely to distort the relevant data. Ideally, indicators collected should capture data on a smaller scale to account for this aspect. For instance the OECD's Territorial Level 3 (TL3), which consists of smaller regions, could be more suitable to measure well-being.

Table 1.4 provides a comprehensive overview of how existing indicators need to be adjusted to that they provide a meaningful tool for policymakers. The table should be seen as a proposal and basis for discussion. The indicators can be operationalised in two ways. The first is by the OECD developing an on-line database at the Territorial Level 3 scale for regions specialised in mining and extractive industries. This would enable statistical benchmarking and analysis at the international level to reveal areas of competitive strength, weakness, and to inform local planning and prioritisation. The second is through OECD Mining Region Case Studies to enable in-depth analysis and diagnosis of well-being opportunities and challenges for individual regions.

Table 1.4. Proposed Indicators

Dimension	Question	Existing Indicator in Regional Well-Being Framework	Indicators specific to mining regions
Income	What does income performance look like and what kind of income inequalities exist?	<ul style="list-style-type: none"> Household disposable income 	<ul style="list-style-type: none"> Wage inequalities across sectors
Jobs	Does local employment increase? In which sectors are jobs created? Who benefits from employment?	<ul style="list-style-type: none"> Employment and unemployment rate 	<ul style="list-style-type: none"> Inequalities in employment Risk of automation in jobs Ratio of LDC
Housing	Is there enough affordable housing for all population groups? Do housing shortages make certain population groups move?	<ul style="list-style-type: none"> Number of rooms per person 	<ul style="list-style-type: none"> Housing expenditure
Health	Are there specific health challenges related to environmental and non-environmental conditions in mining regions?	<ul style="list-style-type: none"> Life expectancy 	<ul style="list-style-type: none"> Common diseases Suicide rates
Education	Are education and training linked to needs of the local labour market?	<ul style="list-style-type: none"> Educational attainment 	<ul style="list-style-type: none"> Ratio low skilled to high skilled workers

Environment	Are there local environmental externalities that harm the environment or alternative livelihoods? How is the natural capital of the region affected through mining?	<ul style="list-style-type: none"> • Air quality 	<ul style="list-style-type: none"> • Water quality • Local CO2 emissions • Cleared forest land/vegetation • Availability of recreational facilities and green space
Accessibility of services	Are public services experiencing particular pressures due population change? Does service provision increase with mining activity?	<ul style="list-style-type: none"> • Broadband 	<ul style="list-style-type: none"> • Satisfaction with health facilities and distance • Satisfaction education facilities (childcare to schools)
Social Connections	Does social cohesion increase or decrease with mining activities? Do people feel at home in mining regions and cities?	<ul style="list-style-type: none"> • Percentage of people who have friends and relatives to rely on in case of need 	
Civic Engagement	Do people feel they have a say in local decision making?	<ul style="list-style-type: none"> • Voter turnout 	<ul style="list-style-type: none"> • Opportunities to engaged in local decision-making • Execution of duty to consult

Source: Author's elaboration.

1.8. Crosscutting issues that matter for well-being in the extractives context

Three main aspects cut across all well-being dimensions in mining regions and impact how the above mentioned key aspects play out. They are the mining life cycle, the general level of development as well as local inequalities. The general level of development of a country or region, determines the overall standard of living and resources present and therefore impacts the level of well-being and possibilities to improve wellbeing. The stage of the mining life cycle is crucial as it defines aspects like level of investments and population growth or decline, which fundamentally affects pressures on housing and public services. The presence of inequalities between population sub-groups i.e mining and non-mining workforce as well as Indigenous peoples and women highlights specific well-being challenges that need to be addressed. The following section discusses how these three aspects need to be taken into account when analysing well-being in mining regions.

1.8.1. Level of Development

While the characteristics of resources specialised economies are similar globally, the way mining affects people's well-being changes with level of development. Existing access to healthcare, amenities and resources as well as overall health status, poverty rates and education have an influence on the effects of mining operations within regions and towns. For instance, in countries with low environmental regulations and general healthcare provision the impact of mining on community health can be much greater than in countries with higher standards and better governance enforcement.

In this regard, it has to be noted that the discussion above largely reflects well-being specificities in OECD countries and does not go into detail about well-being challenges in developing countries. This also means that the discussion above does not reflect on specific well-being challenges related to artisanal and small-scale mining (ASM). ASM is particularly common in developing countries of the global south. While it significantly contributes to national foreign exchange earnings and offers rural employment opportunities, it is also subject to specific challenges like seasonal and precarious work

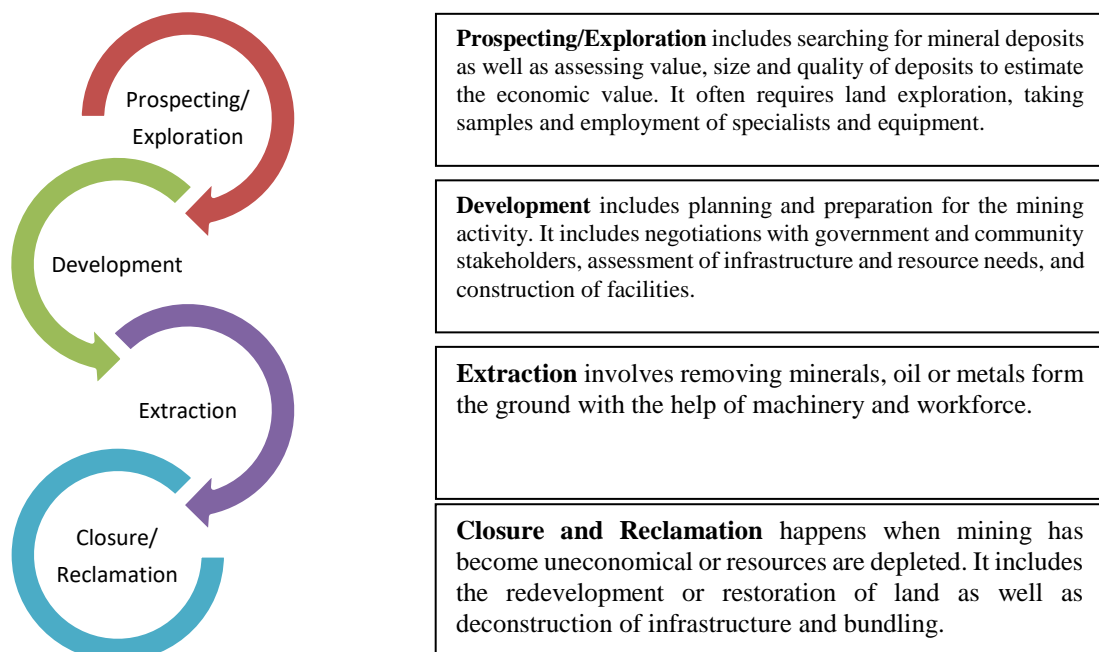
conditions, pollution of streams and rivers and low levels of occupational health and safety (ILO, 1999^[40]) (IIED/IGF, 2017^[40]).

In terms of measuring well-being, people in developing countries start from a different point when it comes to socio-economic outcomes. In OECD countries, the Human Development Index - meaning people's life expectancy, education received and standard of living - is very high with an index of 0.895. In comparison, developing countries, many of whom largely rely on mining in their economies, only reach an index of 0.681. (UNDP, 2018^[35]). This means that outcomes will vary according to the level of development and that the needs to achieve a decent standard of living are a lot greater in developing countries than in developed countries that largely focus on improving quality of life. At the same time, this also means that mining has a greater potential to positively contribute to well-being in developing countries.

1.8.2. Mining Life Cycle

Well-being outcomes for mining regions and cities are largely influenced by the mining life-cycle (Figure 1.2.). The size and type of employment generated, for instance, will vary for each stage of mining development. Largest numbers are usually occur during the development phase when construction takes place. Similarly, pressures on housing and public services increase when population numbers rise due to employment. The reverse scenario can often be observed during mine closure that requires economic restructuring and is characterised by out-migration, reduced government revenues and less need for infrastructure and services. Sometimes, environmental legacy cost also only become visible after mining operations have stopped.

Figure 1.6. The Life Cycle of a Mine



Source: Author's elaboration based on (The University of Arizona, n.d.^[35])

Further statistical analysis will be needed to understand how growth dynamics differ for regions at different points of the mining cycle and how these effect well-being outcomes. For instance, regions could be clustered and matched according to their respective life cycle phase in future work. This would ensure that comparison takes place between regions in similar cycle phases. Further, as region move along the life, cycle analysis of indicators over time would improve the understanding of how well-being changes according to life cycle phases. This way, policy makers could better prepare for possible impact ahead of time and adjust policy responses.

1.8.3. Inequalities

Rising inequalities are a key challenge for national and sub-national governments around the world. To combat inequalities the 2015 the UN Sustainable Development Goals made a call to reduce global inequalities and “leave no one behind”. Inequalities especially affect those already struggling, as it can be harder for them to access quality jobs, public services and have influence in public decision-making. Further, inequalities can hamper economic growth by restricting purchasing power, potentially erode trust in governments and can create social tensions between groups (OECD, 2017^[11]).

Regions with mining and extractive industries are especially prone to inequalities, especially horizontal inequalities. Horizontal inequalities define gaps in average performance between specific population groups (such as men and women, or young and old, Indigenous and non-Indigenous) (OECD, 2017^[11]).

The development of indicators for well-being in mining regions should be sensitive to the well-being of different population groups. This means that analysing data on income, housings, education, civil engagement etc. should specifically be looking at outcomes of these groups and quantify them. Further, regions with Indigenous populations should consider incorporating specific indicators that measure well-being as defined by indigenous peoples. This could for instance involve measuring levels of customary activities, traditional knowledge as well as the application of the duty to consult. The section below offers provides a background on why it is important for regional policy makers to look at the outcomes of a few key population groups more closely.

Indigenous peoples – respecting rights and building capacities

Indigenous peoples are usually defined as those who maintain distinct political, languages, cultural and social practices, and inhabited a region at the time that those of different ethnic origins arrived. The reproduction of indigenous languages and culture is often tied to particular uses of land and water resources. This has important implications for mining and extractive industries particularly in countries such as Australia, Canada, Chile, and Sweden where mining plays an important role in the national economy. Traditional settlement or reservation areas, within which indigenous communities have defined rights, mean that businesses and governments have to take a different approach to regulatory processes and investment proposals in order to balance them with existing land use practices.

Mining regularly occurs on or near Indigenous land. In Australia, for instance, 60% of mining is happening or is planned on land that is subject to native title⁶. Despite this,

⁶ The Commonwealth of Australia enacted the Native Title Act 1993. It provides recognition of pre-existing rights to land and waters to Indigenous Australians. It grants rights of possession, which can be exclusive or not (OECD, forthcoming)

indigenous communities often struggle to benefit from local opportunities linked to mining. For instance, Indigenous representation in the workforce, in Australia, is below the proportion of Indigenous people in the overall population. Simultaneously, many Indigenous peoples see their traditional ways of life threatened through mining. In Sweden, for instance, reindeer herding plays a central role in Sami culture and well-being, development of mines impacts on available herding land (Persson, Harnesk and Islar, 2017^[35]).

With the need for concluding benefit-sharing agreements and the pursuit of gaining social license to operate, company engagement with Indigenous peoples improved (Brereton and Parmenter, 2008^[35]) (Baker and McLelland, 2003^[17]). Lately companies have changed approaches from making job commitments, towards indigenous capacity building and creating options for Indigenous peoples to invest revenues gained through mining according to their own priorities and to the benefit of the community (Söderholm and Svahn, 2015^[18]). A leading example can be observed in the East Arnhem Land in Australia's Northern Territory, where a Gumatj, one of the Yolngu clans, has made use of its royalties to set-up and operate its own bauxite mine, has set up a training centre for their youth and invests in alternative business development projects such as timber processing. Still, there is still much to be achieved.

Indigenous peoples are often only minimally involved in decision making around mine development and often constrained by power imbalances in negotiations with companies or government (Persson, Harnesk and Islar, 2017^[35]). Further, processes for recruiting, retraining and developing indigenous employees need to be improved, to reflect cultural as well as socio-economic specificities. For instance, community pressures for demand sharing with kin, lack of financial literacy amongst Indigenous groups as well as the need to adjust trainings to lower standard of education need to be reflected in employment and training (Brereton and Parmenter, 2008^[16]). Further, there is also a more general need to attain a better understanding of the impact of mining on Indigenous well-being and what well-being means from an Indigenous perspective.

Box 1.4. Red Dog Mine in Alaska – Two Worlds, One Spirit

The Red Dog mine in Alaska is the source of around 5 per cent of the world's zinc supply. It operates under a lease with NANA Regional Corp, Inc., an Alaskan native corporation, and is located in Alaska's Northwest Arctic Borough, which has a population of around 6800, mostly Iñupiat peoples. Since Red Dog went into production 30 years ago, the mine has proven to be a significant basis of NANA's business and an economic generator for the remote region. The Red Dog Mine accounts for 1,338 jobs (direct and contractors) in 2018, of which 55 percent were filled by NANA shareholders. NANA also receives net proceed royalties from the operation. As the only tax player to the local municipality, payments have supported government services to the region's population including schools, services and infrastructure. Key to NANA's success is its understanding and reflection of core values of Iñupiat people. The company's motto "Two Worlds, One Spirit" signifies that decisions are taken guided by linking Iñupiat tradition with corporate mission. For instance, to encourage NANA shareholders to work in the mine, the company has introduced flexible working hours so that people can still find time for hunting, berry-picking, and other subsistence or traditional activities.

Source: (MMSD, 2002^[18]) (Lasley, 2019^[19])

Gender – including women in mining

Mining remains a male dominated work sector. In 2018, women only made up 13.8 per cent of the workforce in mining quarrying, oil and gas extraction in the United States compared to a national average of 47 per cent (United States Department of Labor, 2018_[39]). Similar figures can be found in other countries 16 per cent workforce participation in mining in Australia (Australian Government, 2019_[40]) and between 10 and 20 per cent in Sweden (Abrahamsson, 2014_[41]).

Regionally, this means that women might not benefit equally from local opportunities linked to mining. For instance, regions show larger income inequalities between men and women with increased regional specialisation in mining operations. Studies also show that women are also less represented in influential roles around decision making for mining development leaving them less say with regards to the environmental, occupational and social impacts the operation might have (Gender Resource Facility, 2016_[42]).

High wages in mining might cause women to be inclined to accept a lower personal income (e.g. less working hours) compared to their partners. Further, women might be over represented in less well payed non-mining jobs and therefore more exposed to negative externalities of mining activities like increased housing prices. Reasons for women not to take on work in mining are manifold, but often relate to them disliking the idea of working in a male dominated work environment or missing opportunities to participate in training and skills that would prepare them for jobs in mining (Reeson, Measham and Hosking, 2010_[2]) (Noronha and Nairy, 2005_[8]).

1.9. Conclusion

This paper provides analytical background and input for discussion for the pre-conference of 3rd Meeting of OECD Regions and Cities in Skellefteå, Sweden. It proposes the development of a new set of indicators to measure well-being of mining regions in order to facilitate place-based policy making and, ultimately, contribute to more sustainable, inclusive regional development.

The highly concentrated geographical nature of mining activities, creates specific impediments and opportunities for well-being in these regions. While, mining regions and cities benefit from mining through higher than average income levels and make important contributions to national growth and prosperity, they often struggle to equally distribute benefits among population groups and face challenges to ensure social and environmental aspects of well-being for their citizens.

Key issues for well-being identified in this paper are:

- Income inequalities between population groups;
- Limited job opportunities for local workforce and skills mismatches;
- Pressures on public services and infrastructures;
- Volatility in housing prices, limited affordability or abandonment;
- Depletion of natural capital (degradation of air, land and water quality), land use conflicts, health impacts; and,
- Weakened social cohesion and limited civic engagement.

Addressing these issues is important to assure mining regions benefit from resources extraction and to secure future regional development opportunities. Reducing inequalities, for instance, are beneficial to regional development, as they strengthen social cohesion, increase economic diversification and improve equality of opportunity. Further, approaching environmental and social dimensions of well-being is important to safeguard natural capital needed for future developments and to attract and retain workers that can diversify the economy.

Examining and monitoring progress in well-being dimensions provides an empirical basis to better tailor policies. The paper shows that the current OECD regional well-being framework does not suffice to represent key issues identified. This has two main reasons. Firstly, current indicators do not fully capture the relevant aspects and secondly, the geographical scale (TL2 Level) does not match the geographical scale of the problem.

The paper suggests an amended list of indicators to measure well-being in mining regions and points to three cross-cutting aspects that need to be investigated in order to better understand well-being in mining regions. These include, the general level of development of a country or region, which determines the overall standard of living and resources present, a further analysis to understand how outcomes and growth dynamics differ for regions at different points of the mining cycle and the presence of inequalities between population sub-groups i.e. Indigenous peoples and women, which requires indicators sensitive to these issues.

Annex A.

Country	Regions	Code	LQ
AU	Western Australia	AU5	2.95
AU	Northern Territory	AU7	2.07
CA	Newfoundland and Labrador	CA10	2.58
CA	Saskatchewan	CA47	2.45
CA	Alberta	CA48	3.10
CL	Tarapacá	CL01	4.37
CL	Antofagasta	CL02	7.03
CL	Atacama	CL03	6.63
CL	Coquimbo	CL04	4.54
CL	Valparaíso	CL05	3.32
CL	O'Higgins	CL06	4.07
CL	Magallanes y Antártica	CL12	3.76
CZ	Northwest	CZ04	2.15
EL	South Aegean	EL42	2.44
EL	West Macedonia	EL53	6.83
EL	Central Greece	EL64	2.92
FR	Guyane	FRY3	1.93
HU	Southern Transdanubia	HU23	1.90
KR	Gangwon	KR06	3.21
ME	Campeche	ME04	2.68
ME	Durango	ME10	2.94
ME	Sonora	ME26	2.70
ME	Tabasco	ME27	2.66
ME	Zacatecas	ME32	1.97
NO	Agder and Rogaland	NO04	2.66
PL	Slaskie	PL22	2.88
SE	Upper Norrland	SE33	2.96
TR	Northern Aegean	TR33	2.17
TR	Western Black Sea - West	TR81	3.35
UK	Northern Ireland	UKN	2.14
US	Alaska	US02	4.58
US	Kansas	US20	2.53
US	Louisiana	US22	2.88
US	Montana	US30	2.31
US	New Mexico	US35	3.42
US	North Dakota	US38	5.16
US	Oklahoma	US40	5.87
US	Texas	US48	3.24
US	West Virginia	US54	4.50
US	Wyoming	US56	7.61

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