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The 2020 SDG Index for Flemish Cities

Construction and Analysis

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Valentijn Vanoeteren is a senior consultant of Regional & Urban Development at IDEA Consult. In this role he focuses on strengthening administrative power through substantiated policy evaluation and supported strategic planning. This has seem him apply his expertise for local authorities, the Flemish government, the federal government and the European Parliament. For example, he participated in the merger processes of Lievegem, Kruisem and Puurs-Sint-Amands. He also evaluated many strategic policy measures, such as the reform of the integration and civic integration sectors, the activation of people entitled to social assistance benefits through temporary work experience and the coordinating role of the social economy.

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Abstract

This working paper explains the construction of a set of indexes that summarise the performance on the Sustainable Development Goals (SDGs) for all 300 Flemish municipalities. The 2020 edition of the Flemish SDG index and monitor offers a number of improvements over the previous version, including an expanded set of indicators, the use of the newly released household survey data as well as the ability to track the scores over time. This data is used to construct indexes comparing the performance of the municipalities relative to the top and bottom performances in Flanders. Having constructed the indexes, we then try to distinguish and explain the patterns that can be identified in the overall score, as well as the score on the individual SDGs. Specifically, we look at geographical, demographic and economic characteristics of the municipalities. In this way, we aim to offer policymakers different ways to understand the performance of their municipalities. As such, the exploratory nature of the findings of this working paper displays the versatility of recently developed monitoring tools to facilitate the implementation of the SDGs. The comparative nature of the index can help pave the way for municipalities who wish to take pro-active stances towards reaching the SDGs by 2030.

Contents

1 Introduction

The Sustainable Development Goals (SDGs) were adopted in 2017 by all UN member states as part of the 2030 Agenda for Sustainable Development. Conceived on a global scale, these SDGs now need to be applied at the local level, as the Sustainable Development Solutions Network (SDSN) estimates that 65% of the successes of the SDGs depend on the immediate and active involvement of municipalities in the implementation processes (Lafortune et al., 2019). In light of this, a need has arisen to design a local 'tailor-made' implementation strategy for the SDGs.

There is widespread and palpable enthusiasm among the Flemish municipalities to take up a more active role in the path toward a more equitable and sustainable future. A third of Flemish cities have signed the SDG declaration of commitment, and 60% have integrated the SDGs in their 2020-2025 policy and management cycle (VVSG, 2020). Throughout this process, they have received the assistance of the Association of Flemish Cities and Towns (VVSG - *'Vereniging voor Vlaamse Steden en Gemeenten'*), which has developed pilot projects and monitoring platforms to facilitate the implementation of these objectives. Despite these efforts, the monitoring of the SDGs remains a challenge. There is a need for local governments to know: *'where are we doing well and where are we underperforming, where are we making progress or going backwards?'* (VVSG, 2020, p.18).

To address this need, IDEA consult constructed a first edition of the SDG monitor for all Flemish cities in 2020. Additionally, they developed an online platform that helps these cities gain a deeper understanding of their performance (available at `https://www.sdgmonitor.be`). A major source of information used to construct this tool comes from the Town and City Monitor (*'Gemeente-Stadsmonitor'*) which was constructed by the Flemish Agency of Internal Affairs (*'Agentschap Binnenlands Bestuur'*). This database combines information from official statistical sources with a three-yearly household survey, giving an exhaustive description of the socio-economic and environmental situation of the Flemish municipalities. Concurrently with IDEA, UNU-CRIS constructed a SDG-index for all Flemish municipalities using the same database. Their focus was on identifying patterns in the different SDG scores, looking in particular at the effect of differences in municipal income and size (Standaert, Rayp, Konstantinis, 2020). Given the high level of complementarity between the SDG monitor and index, IDEA and UNU-CRIS decided to combine their efforts for the second edition of the SDG monitor.

This second edition builds on the previous one in several ways. First, it updates the data and introduces new indicators to provide a more comprehensive picture of the performance of Flemish municipalities on the SDGs. The selection of indicators is based on those included in the Town and City Monitor, enhanced with information from databases from the Flemish regional government and the provinces.

It is interesting to note that the index uses the latest update of the household survey data, giving us a complete and up-to-date picture of many of the indicators.

One of the biggest changes with respect to IDEA's first monitor is that it is now possible to study the evolution of performances over time. We collected historical data when possible, allowing the municipalities to trace their performance into a wider time-frame. This enables them to see whether a low score is a momentary dip, a long-term problem or an improvement on historically lower scores. Altogether, we collected close to 100 indicators, primarily detailing the socio-economic and environmental outcomes of all 300 Flemish municipalities. A large portion of these indicators comes from the survey data in the Town and City Monitor and as such only goes back to 2014 in most cases, and to 2011 for the larger regional cities. For this reason, we only computed the index from 2011 onward.

To evaluate a city's progress on each SDG, we first put the indicators on an equal footing. Following the methodology of international studies (e.g. Lafortune et al., 2019; Aalbers, 2020), each municipality is compared to the top and bottom performance in Flanders of that year. A score of 100 means that the municipality has the best performance for that indicator, and vice versa for a score of zero. This relative scoring ensures that performances are evaluated relative to representative sample: i.e., cities with a highly similar legal, historical and economic context. That being said, the SDG indexes in this report do not indicate the extent to which a town is on its way to meeting all SDG goals. Rather, it expresses how well it is performing relative to other Flemish cities. Even a perfect score on a particular SDG does not necessarily indicate that there is no further room for improvement. Similarly, an increasing score does not suggest that this municipality is necessarily improving, but only that its position relative to the top and bottom performances is changing.

Building on the work by Standaert, Rayp, Konstantinis (2020), we subsequently analyse the SDG indexes to try to identify the patterns that underlie the scores. Our goal is to evaluate to what extent the SDG scores correlate to those socio-economic and demographic characteristics that lie outside a municipality's immediate control. One the one hand, this allows us to answer questions such as whether more populous cities score better or worse; or which of the SDGs is more affected by the population size. By running this analysis in a regression framework, we can also control for the other characteristics. For example, given its population size and the share of the elderly, do cities with a higher median income score better on the SDGs? This analysis can also give us a clue as to the level of influence a city has over its SDG performance. Given the (short term) immutable characteristics, how much do the scores vary between municipalities? This is not just to list those municipalities that score lower than we would expect, but rather to give them examples of cities in similar circumstances that can provide a best practice.

As it would be infeasible to talk about each municipality separately, we instead look at the results of this analysis first on the provincial level. We then consider the more fine-grained reference regions ('*referentieregios*')[1] as well as the socio-economic clusters grouping municipalities based on economic, demographic and geographical characteristics (Gielens, 2018).

The next section (2) outlines how the Flanders Cities SDG index is constructed. Section 3 describes the results and studies the evolution of the indexes and their representativeness. Section 4 analyses the patterns in the index on the provincial (4.1) level, between the different reference regions (4.2) and using the Belfius typology (4.3). Section 5 concludes.

2 Construction of the index

2.1 Indicator selection

To select relevant indicators, we make use of the already existing database of the town and city monitor. This database contains over 300 indicators on the town level, roughly one third of which are from a representative household survey administered every three years. As of July 2021, the results of the 2020 household survey data are available, meaning that most of the indicators are available for 2020. For the handful of indicators that are not available in that year, we use the earlier or later values, as indicated by the superscripts in Table 1.

In our choice of indicators, especially in mapping those indicators to specific SDG goals, we follow two previous indexes created by Lafortune et al. (2019) and Aalbers (2020). One restriction when assigning indicators to SDGs is that we avoid assigning the same indicator to different goals. However, the number of indicators for which such a choice had to be made was relatively limited and often quite straightforward. For example, while the gender gap in unemployment can be assigned to *SDG10* Reduced Inequalities, it is a more natural fit for *SDG5* Gender Equality.

Our selection of indicators is based on two main criteria. First, the indicator must have a clearly identifiable impact on the SDG preparedness of a particular town. This excludes a large number of the 300 indicators in the VVSG dataset, like those unrelated to the SDG goals, those whose impact on the SDGs is not unambiguously positive or negative, as well as those that reflect the SDG preparedness of the entire Flemish region. The second criterion concerns the availability of data. We follow the Euro-cities report in requiring that an indicator should cover at least

[1] Reference regions refer to regions at which cooperation at the intermunicipal and supralocal levels takes place in Flanders. There are currently 17 reference regions. https://lokaalbestuur.vlaanderen.be/nieuws/vlaamse-regering-verdeelt-vlaanderen-in-17-referentieregio%E2%80%99s

80% of the sample.

Table 1 summarizes the indicators that were included for each of the goals. All goals contained at least two and on average more than four indicators. The only exception is *SDG14* Life Below Water), where we were unable to find indicators that met both criteria.

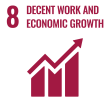
For some specific sub-goals of the SDGs, the town and city monitor offers multiple suitable indicators. However, including all of them risks drowning out the signal from those sub-goals in which only one indicator is available. To avoid them dominating the overall score on the SDG, we combined those indicators in a sub-index. These variables are indicated by the summation symbol in Table 1. For example *SDG11f* (Neighbourhood nuisance and safety) summarises 10 indicators that each touch upon one aspect of this sub-goal. If instead all of the indicators for *SDG11* were included separately, the weight of the *SDG11e* (availability of social housing) would be four times smaller than it currently is.

On January 1 2019 a number of cities merged, bringing the total number of municipalities down to 300. While most official sources now only list the data for the new municipalities, we did encounter situations in which the older data was only available for the old municipalities. In those cases, we computed the indicator value for the old municipality. In those cases where both the numerator and denominator were available for the old municipalities, this was a straightforward sum (e.g., *SDG2b*: CO2 emissions from agriculture per inhabitant). If only the fraction was known, we used the population-weighted sum (e.g., *SDG6b:* percentage of homes with access to sewage system).

The full list of indicators with their names in Dutch and their source can be found in Appendix A.

Table 1: Indicators included in the Flemish SDG index

			Sign
SDG1 - No Poverty			
	a	Fraction of people for whom the cost of housing exceeds 30% of income	-
	b	People receiving financial support	-
	c	People experiencing payment difficulties	-
	d	Number of children in subjective poverty[l1]	-
SDG2 - Zero Hunger			
	a	CO2 emissions from agriculture[l1]	-
	b	Fraction of agricultural land used for organic agriculture	+
SDG3 - Good Health and Well-being			
	a	$\sum$ Satisfaction with the infrastructure for healthcare, youth and the elderly	+
	b	Prevalence of chronic diseases[l2]	-
	c	Road traffic injuries and deaths[l1]	-
	d	Death rate[l1]	-
	e	$\sum$ Screening for cancer[l1]	+
	f	Participation in sports	+
	g	Preventative dental care[l2]	+
	h	Prevalence of diabetes[l2]	-
SDG4 - Quality Education			
	a	Fraction of people dropping out of secondary education[l1]	-
	b	Underprivileged students[l1]	-
	c	Unemployed with low levels of education	-
	d	$\sum$ School delays	
	e	$\sum$ Quality and availability kindergarten	+
SDG5 - Gender Equality			
	a	Gender gap in employment (male - female)[l2]	-
	b	Incidence of domestic abuse[l1]	+
	c	Gender gap in part-time employment incidence (male - female)	-
SDG6 - Clean Water and Sanitation			
	a	Houses connected to sewerage system	+
	b	Houses whose waste water is treated	+
	c	Soil sealing[l5]	-
SDG7 - Affordable and Clean Energy			
	a	$\sum$ Energy poverty of households	-
	b	Local production of renewable energy[l1]	+
	c	Decrease in CO2 emissions due to renewable energy production[l1]	+
	d	Charging stations for electric vehicles	+

			Sign
SDG8 - Decent Work and Economic Growth			
	a	Employment ratio for 20 to 64 year olds[l2]	+
	b	Net growth rate startups[l1]	+
	c	∑ Unemployment rate of women, youth and the elderly	-
	d	Long-term unemployment rate	-
	e	Gross value added per employee[l2]	+
	f	Vacant retail floor space	-
	g	Vulnerable (e.g., with disabilities) people employed in the social economy	+
SDG9 - Industry, Innovation and Infrastructure			
	a	CO2 emissions in tertiary sector[l1]	-
	b	CO2 emissions in industry[l1]	-
	c	Lack of access to high-speed internet	-
	d	Employment in sectors with potential for economic renewal	+
	e	Employment in medium and high-tech sectors	+
SDG10 - Reduced Inequalities			
	a	∑ Attitude towards diversity	-
	b	Income inequality[l2]	-
	c	Employment rate gap of Belgians vs. non-EU citizens[l2]	-
SDG11 - Sustainable Cities and Communities			
	a	Satisfaction with housing	+
	b	∑ CO2 emissions public transportation and street lights[l]	-
	c	Sustainable transportation	+
	d	∑ Unsafe traffic conditions for children and cyclists	-
	e	Availability social housing	+
	f	∑ Neighbourhood nuisance and safety	-
	g	Satisfaction with cultural activities	+
SDG12 - Responsible Consumption and Production			
	a	Non-recycled waste per citizen[l1]	-
	b	Vehicles with ECO score above 70	+
	c	Employment in circular economy[l1]	+
	d	Sustainability of housing	+
SDG13 - Climate Action			
	a	CO2 emissions households[l1]	-
	b	CO2 emissions private and commercial transportation[l1]	-
	c	Energy consumption per household[l1]	-
SDG14 - Life Below Water			
		*None*	

			Sign
SDG15 - Life on Land			
	a	Municipal spending on environmental protection	+
	b	Speed with which soil is sealed	-
	c	Undeveloped land	+
	d	Satisfaction with green infrastructure	+
SDG16 - Peace, Justice and Strong Institutions			
	a	Perception of unsafety	-
	b	Crime incidence	-
	c	Mistrust in police	-
	d	Mistrust in municipal government	-
	e	Satisfaction with municipal services	+
	f	$\sum$ Satisfaction with information sharing by local government	+
	g	Satisfaction with citizen participation	+
SDG17 - Partnership for the Goals			
	a	Municipal spending on development assistance	
	b	Municipal debts per inhabitant[l1]	

[l1]: 2019 values, [l2]: 2018 values, [l5]: 2015 values

2.2 Standardisation

After selecting the indicators, we put them on equal footing such that they can be more easily compared and combined. To that end, we follow the methodology proposed in (Lafortune et al., 2019) and (Aalbers, 2020) to normalise the indicators and combine them into the SDG indexes.

Specifically, the construction of the indexes follows these steps:

1. For each indicator, we define a desired direction, negative or positive, according to whether or not the increase of this indicator is socially desirable. The last column of table 1 summarises the directions associated with each indicator.

2. Since the SDG achievement of the Flemish cities is evaluated intra-regionally, we use the best and worst performers in each year as the benchmark values to rescale the indicators. For the top performers, we use the highest value as the maximum, while for the bottom performers, we use the average of the lowest 10% scoring cities.

   One exception to this rule, is if the top-scoring municipality is Herstappe. As it counts fewer than 90 inhabitants, Herstappe's values can differ strongly from those of the other Flemish cities. One example is the percentage of long-term unemployed (*SDG8d*), which is 0 for Herstappe, while the second-to-best performing municipality has 10.5% (Hooglede). Excluding Herstappe in this way has little effect on the index itself. Herstappe's score remains 100,

while the scores of all other municipalities are increased, resulting in a more informative indicator.

3. Having defined the minimum ($\min_t^x$) and maximum value ($\max_t^x$) in each year, t, we then apply the min-max method to normalise the score of the indicators. For the positive indicators, the scores are derived using Equation 1 while the negative indicators are normalised using Equation 2. So, if x_{it} is the indicator value of municipality i in year t before normalization, the rescaled value y_{it} is given by

$$y_{it} = 100\frac{x_{it} - \min_t^x}{\max_x - \min_t^x} \text{ if } x \text{ is a positive indicator} \quad (1)$$

$$y_{it} = 100\frac{\max_t^x - x_{it}}{\max_t^x - \min_t^x} \text{ if } x \text{ is a negative indicator} \quad (2)$$

   After normalisation, a score of 100 means that the municipality has the best performance on that indicator of all municipalities in Flanders, while 0 means the opposite.

4. If a town receives a score less than 0 or greater than 100, its score is set equal to those values.

5. A number of goals contain sub-indexes as indicated by the summation sign ($\sum$) in Table 1. For example *SDG3* Good Health and Well-being contains two such indicators, *SDG3a* and *SDG3b* that each combine three underlying indicators. To create these sub-indexes, we first normalise the underlying indicators and combine them using an (unweighted) mean.

2.3 Computation of the indexes

After standardisation, we compute the SDG indexes by taking the unweighted average of all of the relevant indicators. The overall score on the SDG is the average of the SDG sub-indexes themselves.[2] This results in an index that has the same interpretation as the indicators: 100 means the municipality has the highest score on all indicators and vice versa for 0. As part of the robustness checks of the index, we also use the geometric mean as an alternative to the arithmetic mean to combine the different indicators. The results are described in Appendix C.

The data availability differs widely among the different variables. Exactly half of the indicators cover the year 2020, one third go up to 2019, eleven only cover 2018, and one (*SDG6c* soil sealing) is only available for 2015. The latest available data is indicated in Table 1 using superscripts.

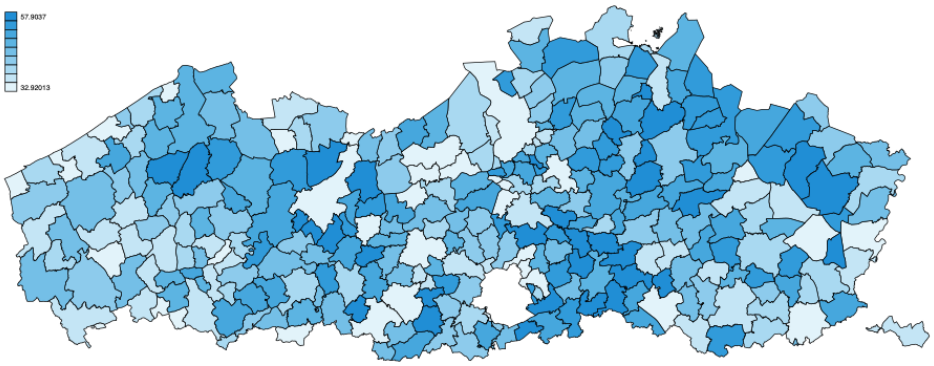
To avoid that the absence or presence of certain variables causes random shifts in the index, we use the lagged values of the indicators when needed. To compute the latest values of the SDG index, the 2019 values are used whenever the 2020 values are missing. If the 2020 and 2019 values are unavailable, we then use the

[2] Computing the overall score as the average of all of the indicators results in an index that is practically identical.

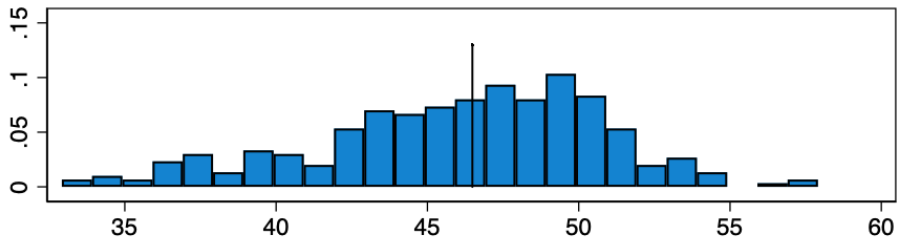
2018 values, and so on. For the 2019 index this process was repeated without considering possible 2020 values. In practical terms, this means that the 2020 index uses the 2020 survey data, while the 2017 to 2019 indexes use the 2017 survey data.

3 The 2020 Flemish cities SDG index

Following the methodology outlined above, we compute the SDG score of all 300 Flemish cities from 2011 to 2020. To give an overview of the overall performance, panel (a) of Figure 1 plots the total index values on a map of Flanders. While in theory the index values can lie between 0 and 100, the actual range of the SDG index is much more limited. The lowest scoring town, Ronse, has an average SDG score of 33.4, while the best scoring town, Bierbeek, only scores 57.3. Overall, the scores lie rather close together as can be seen in the histogram in panel b: 80% of the scores fall within a 13-point window (39.1-52.1).



(a) map



(b) histogram

Figure 1: Histogram and plot of the SDG index

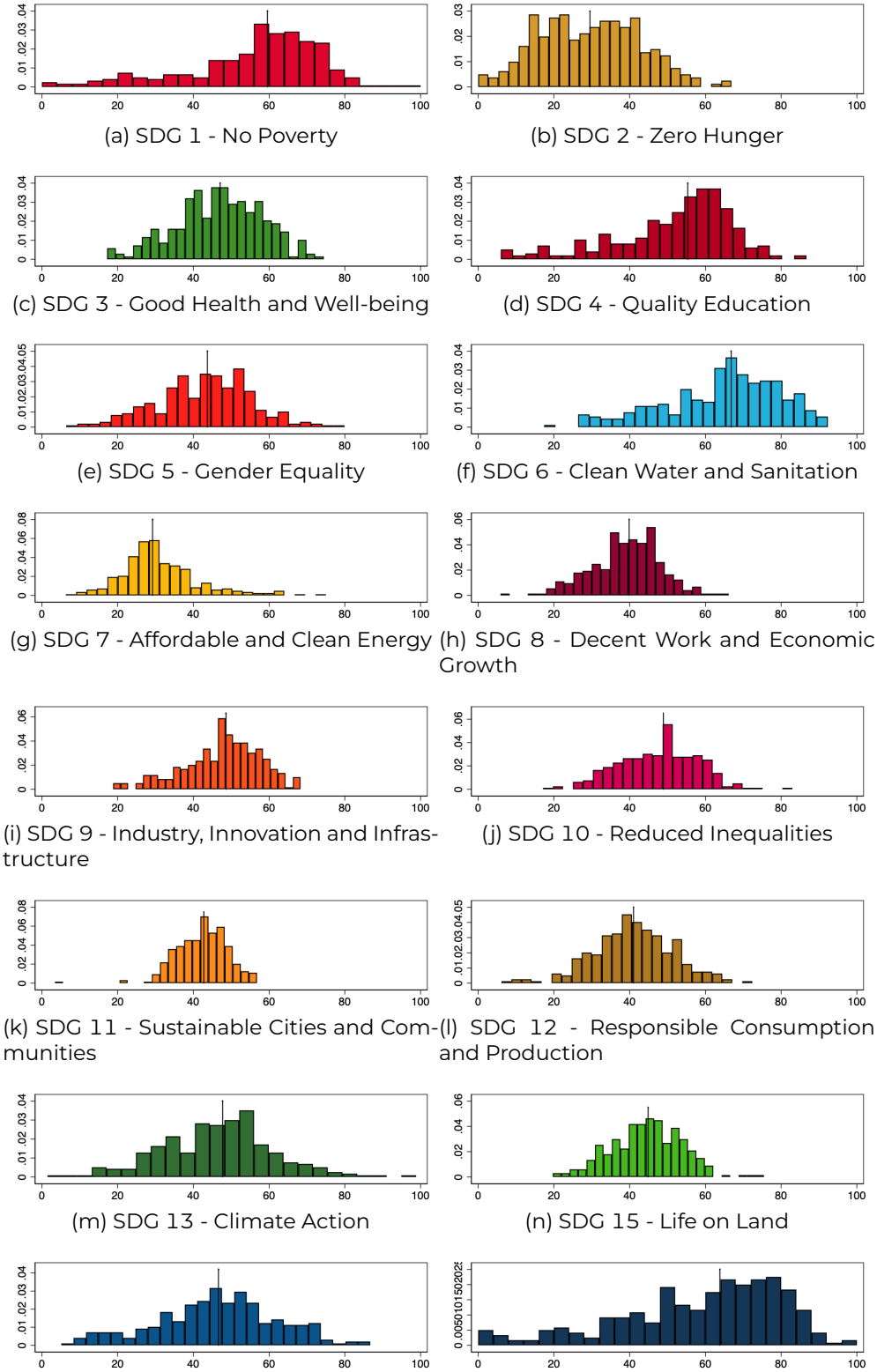
The fact that 75% of cities have a score below 50 means that the majority of cities have more indicators for which they score less than halfway between the top and bottom performer. Intuitively, we might expect to observe a median score of 50, whereas for most SDGs, the median scores lies below that number (cf. the black vertical line in Figure 2). This is because the normalisation scheme implies that a score of 50 is assigned to the municipality whose score is halfway between the top score and bottom score. This is illustrated well by the Local Production

of Renewable Energy as a Percentage of Total Energy Consumption: three out of four municipalities get less than one fifth of their energy from renewable sources, while four municipalities produce more energy from renewable sources than they consume.[3] Wachtebeke, which has a score of 50 on this indicator, is the 24th best scoring municipality. This highly left-skewed distribution is also visible in the overall scores on *SDG7* Affordable and Clean Energy (Figure 2, panel g).

It is important to reiterate that these relatively low scores do not necessarily indicate that Flanders is scoring poorly on the SDGs, as the indexes only compare Flemish cities with each other. Similarly, a good score for a municipality does not imply that it will do well when compared internationally. Instead, the top scores are most useful in identifying best-practices for specific SDGs or indicators among the Flemish cities.

Overall, the individual SDG indexes have a much wider range than the overall SDG index (Figure 2). The range of the 16 SDG indexes is on average three times that of the overall index and three indexes have a range equal to the theoretical maximum (cf. Appendix B). The distribution of the scores can notably differ depending on the indicator, both statistically (Figure 2) as well as geographically (Figure 3). For example, while the value for *SDG8* Decent Work and Economic Growth decreases as we travel from West-Flanders to Limburg, this pattern is completely reversed in the case of *SDG3* Good Health and Well-being. *SDG7* Affordable and Clean Energy has a highly left-leaning distribution, with most cities receiving only very low scores, but the opposite is true for *SDG1* No Poverty, *SDG6* Clean Water and Sanitation, and *SDG17* Partnership for the Goals.

[3] These municipalities are Pittem (134.7%), Meerhout (131.9%), Gingelom (131.7%) and Wuustwezel (103.2%).



(a) SDG 1 - No Poverty

(b) SDG 2 - Zero Hunger

(c) SDG 3 - Good Health and Well-being

(d) SDG 4 - Quality Education

(e) SDG 5 - Gender Equality

(f) SDG 6 - Clean Water and Sanitation

(g) SDG 7 - Affordable and Clean Energy

(h) SDG 8 - Decent Work and Economic Growth

(i) SDG 9 - Industry, Innovation and Infrastructure

(j) SDG 10 - Reduced Inequalities

(k) SDG 11 - Sustainable Cities and Communities

(l) SDG 12 - Responsible Consumption and Production

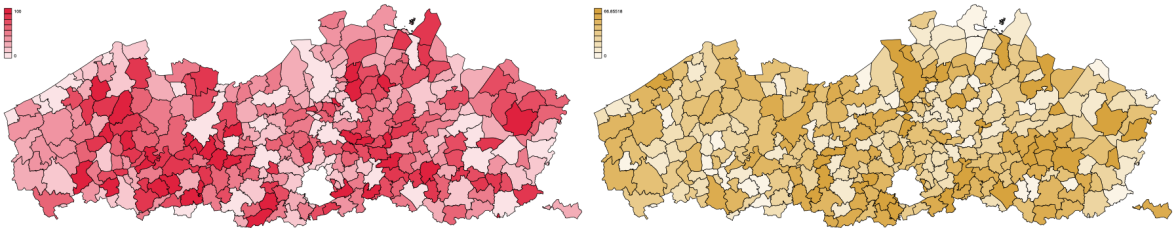
(m) SDG 13 - Climate Action

(n) SDG 15 - Life on Land

(o) SDG 16 - Peace, Justice and Strong Institutions

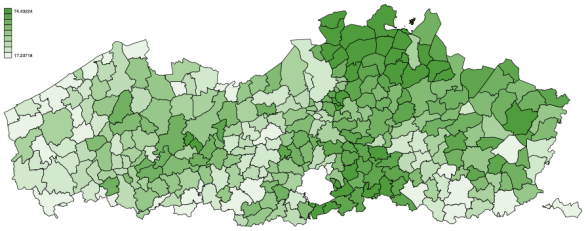
(p) SDG 17 - Partnership for the Goals

Figure 2: histograms of the SDG indexes for each goal
The thin black line indicates the median score

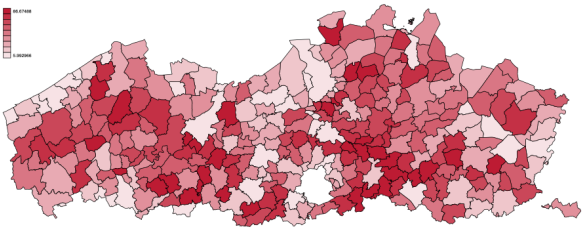


(a) SDG1 - No Poverty

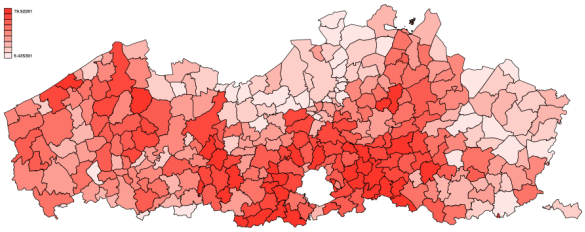
(b) SDG2 - Zero Hunger



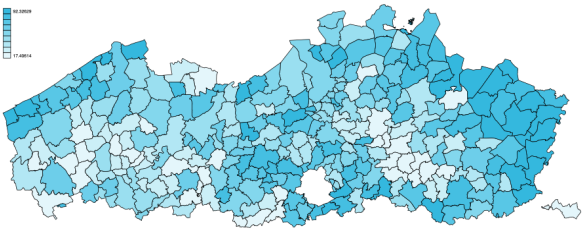
(c) SDG3 - Good Health



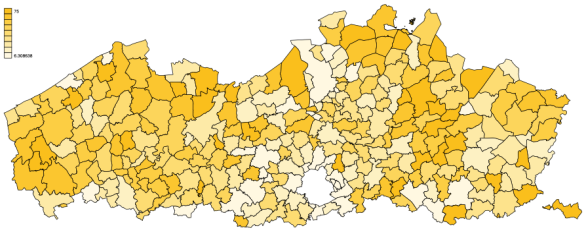
(d) SDG4 - Quality Education



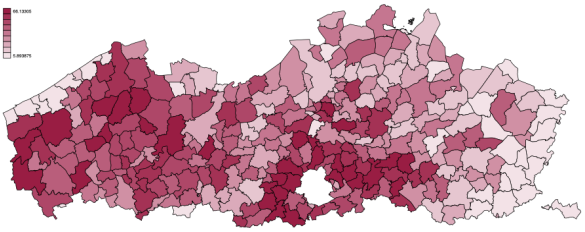
(e) SDG5 - Gender Equality



(f) SDG6 - Clean Water

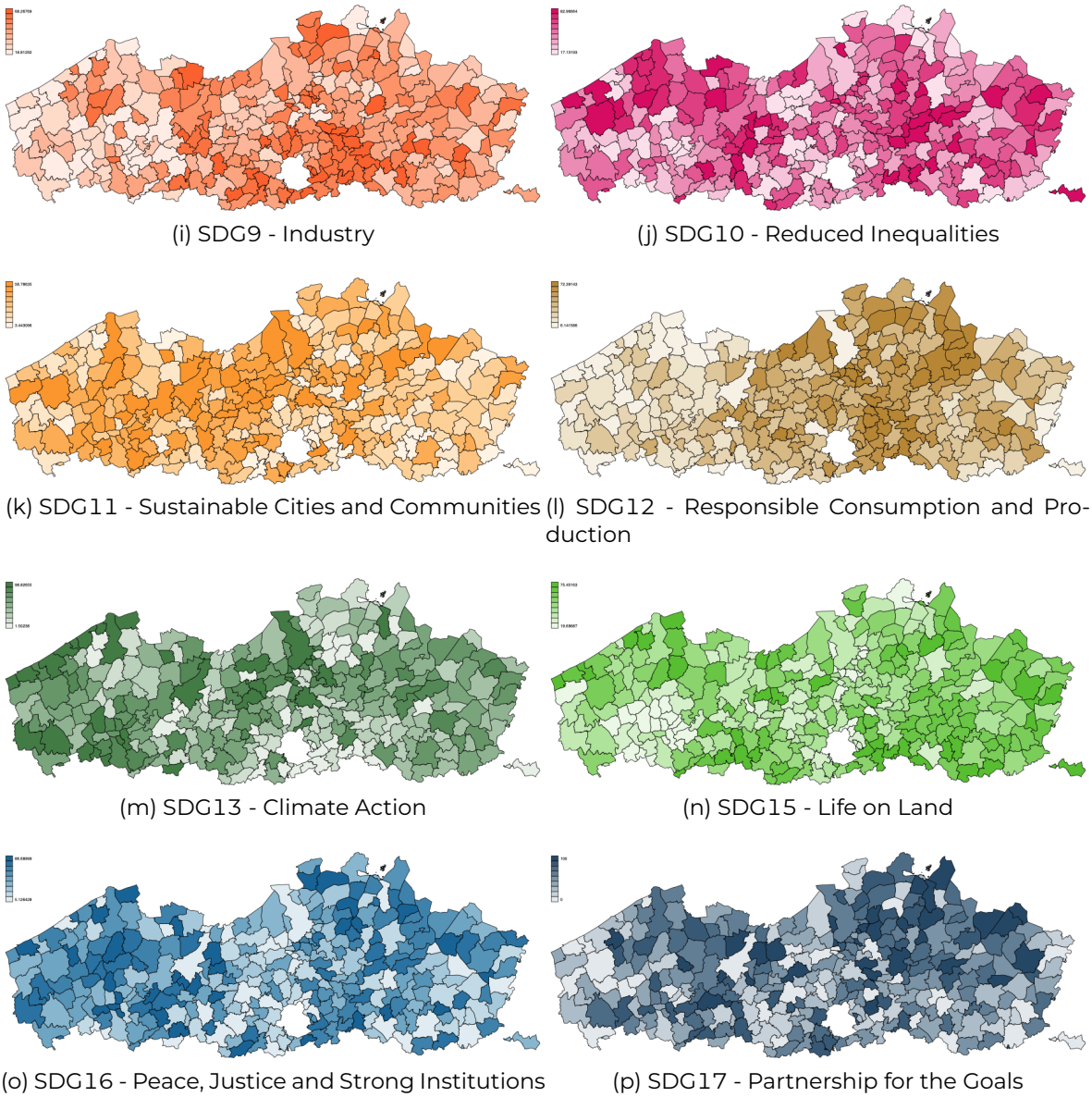


(g) SDG7 - Affordable and Clean Energy



(h) SDG8 - Decent Work and Economic Growth

Figure 3: Maps of the Flanders Cities SDG indexes for each goal
Darker colours corresponding a higher level of preparedness.



(i) SDG9 - Industry

(j) SDG10 - Reduced Inequalities

(k) SDG11 - Sustainable Cities and Communities

(l) SDG12 - Responsible Consumption and Production

(m) SDG13 - Climate Action

(n) SDG15 - Life on Land

(o) SDG16 - Peace, Justice and Strong Institutions

(p) SDG17 - Partnership for the Goals

Figure 3: Maps of the Flanders Cities SDG indexes for each goal
Darker colours corresponding a higher level of preparedness.

3.1 Representativeness of the index

The inconsistencies in the patterns of the SDG indicators suggest there are many counterbalancing patterns present in the different indicators. Almost one third of the indexes are negatively correlated with each other and only one in six has a correlation greater than 0.25 (Appendix B). Given the strong diversity in the topics of the SDGs, this is not a surprising finding. However, it does raise questions as to the extent to which the overall index is capable of capturing the differences in the performance on the various SDGs.

To assess this question, we first consider the extent to which the 16 SDG indexes are able to capture the underlying indicators. To that end, the last column in the summary statistics table (Appendix B) shows the Cronbach's alpha coefficient of the indicators for each of the goals. This statistic is a measure of the internal consistency of a set of variables. It typically lies between 0 and 1. As a rule of thumb a coefficient of 0.7 or higher signals a set of indicators that are consistent with each other. Half of the SDGs have a Cronbach alpha coefficient higher than 0.7.[4] The overall SDG index has one of the lowest alphas, confirming what we observe in the correlation table: namely that the average SDG score hides a lot of the variability between the different SDGs and even within some of the SDGs.[5]

The differences in the patterns of the individual SDGs raise an additional concern: to what extent is it appropriate to compensate low scores on one goal with higher scores elsewhere? In other words, should a city with low environmental scores but high scores for economic development be seen in the same light as one with moderate scores for both? Using a simple average to combine the indicators (cf. section 2.3) carries with it the underlying assumption that these goals are perfect substitutes. To check the impact of that assumption, we also compute the indexes using a geometric mean, as it includes a penalty for imbalances in the scores.[6] For most SDGs, this makes little difference on the final score, other than an overall decrease. In all but two cases, the correlation between the SDG goals is in excess of 85% and half of the SDGs have a correlation higher than 90%. Only *SDG8* Decent Work and Economic Growth (78%) and *SDG11* Sustainable Cities and Communities (83%) have a correlation that is slightly lower, and the correlation between the overall indexes ends up being 87%. More details on the differences in the index when using the geometric mean can be found in Appendix C.

Overall, the results of this analysis fall in line with an often-emphasised point: the SDG index should not be used to simply rank cities or to name and shame the best and worst ones. The differences in the performance vis-à-vis the individual goals is such that a ranking bears little to no meaning. Even within a specific goal, different indicators will often come to a different conclusion. However, this is not to say that summarising the results into indexes is without use, as noted in the report on the SDG pilot project '17 SDGs can be a lot' (VVSG, 2020, p.18) as the

[4] This is the alpha coefficient when the signs of the indicators are fixed (positive).

[5] An exploratory principle component analysis suggests that we would need at least six different indicators to try to summarize the SDG performance in 2020.

[6] The arithmetic mean of $\{y_1, ..., y_n\}$ is given by $\frac{1}{n}\sum_{i=1}^{n} y_i$, while the geometric mean is computed as $(\Pi_{i=1}^{n} y_i)^{\frac{1}{n}}$.

indexes can serve as a starting point of a more in-depth analysis of a town's performance. They can identify the areas in which they are leading and lagging, and find examples of cities that can present best practices, all while keeping an overview of the larger SDG performance. Moreover, the indicators are transformed in such a way that it is straightforward for leading cities to put their best-practices on display, thus creating a powerful tool for cities interested in increasing their long-term sustainability.

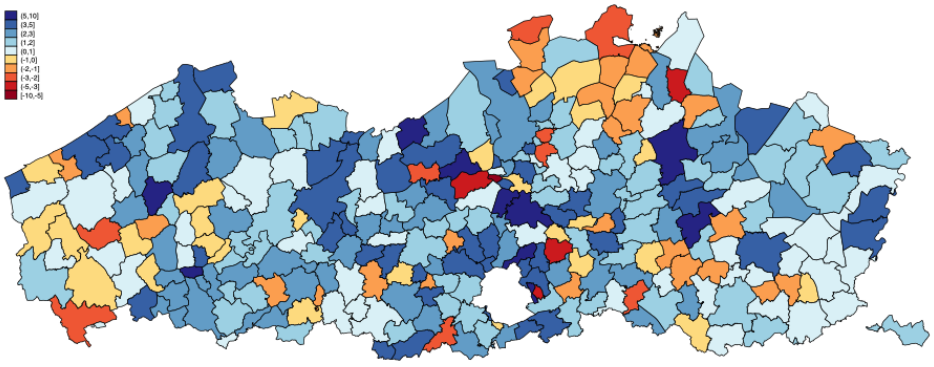
3.2 Evolution of the performance over time

One of the major improvements in the 2020 edition of the index (available at https://www.sdgmonitor.be) is that the change in the indicators over time has been tracked for as many years as possible. When constructing the database we notice that the data availability takes a sudden drop prior to 2011, as this is the first year that the household survey data is available. As a result, the changes in the availability in the data cause such variation in the data that any comparisons are rendered meaningless. For that reason, we only compute the SDG index from 2011 onward. Nevertheless, even with this restriction, it remains important to consider whether the change in the index value is not due to a change in the availability of the underlying data.

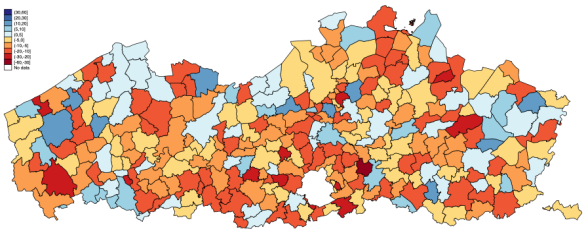
A second issue to be aware of when making comparisons over time is that the index compares the *relative* performance on a year-to-year basis. Specifically, the indicators are normalised using the minimum and maximum value of that year, and this value can change over time. As a result, a change in a municipality's score does not necessarily reflect a change in its performance. For example, if only the best scoring municipality improves its performance, this will leave its score unchanged (i.e., 100), while decreasing the score of all other municipalities. A decrease in this municipality's performance will leave its index similarly unaffected, while raising that of all other municipalities.

To address both issues, this paper first compares the performance in 2020 to that of 2017, which are the last two years in which the household survey data is available for all municipalities. Second, we compute an alternative version of the index where the standardisation of the indicators uses a fixed minimum and maximum value, computed over all years. This small methodological change results in a more straightforward interpretation of the changes over time, which then represent an *absolute* improvement or deterioration of the performance of a municipality. This change is illustrated in Figure 4, with red colours signalling a deterioration and blue colours an improvement.

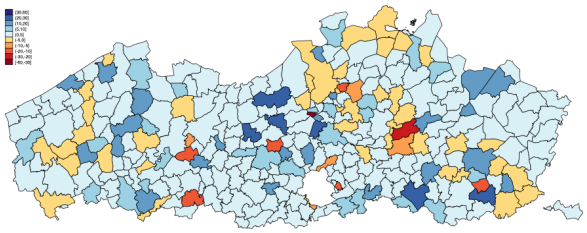
Flemish cities show a consistent improvement over the last few years. Comparing the years where the survey data is available, the SDG scores increased an average of 1.3 points since 2017, 3.0 points since 2014 and 5.4 points since 2011. Looking at the individual municipalities in panel (a) of Figure 4, we notice that most municipalities have improved and, in particular, the larger regional cities. Overall, more than three quarters of the cities have increased their performance in the last three years.



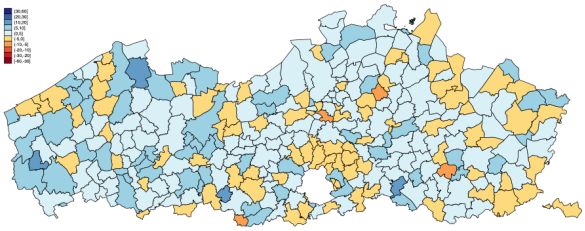
(a) SDG



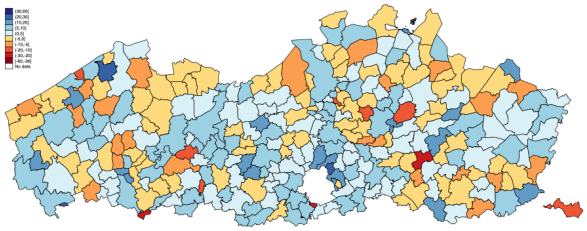
(b) SDG1 - No Poverty



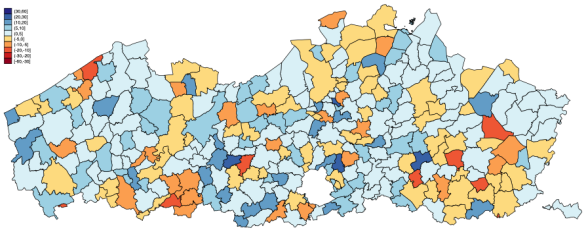
(c) SDG2 - Zero Hunger



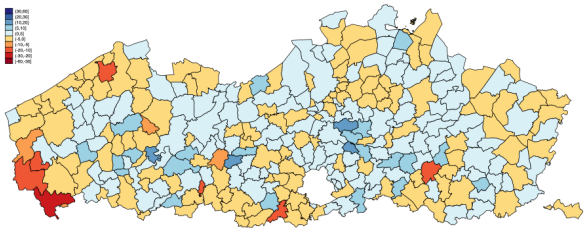
(d) SDG3 - Good Health



(e) SDG4 - Quality Education

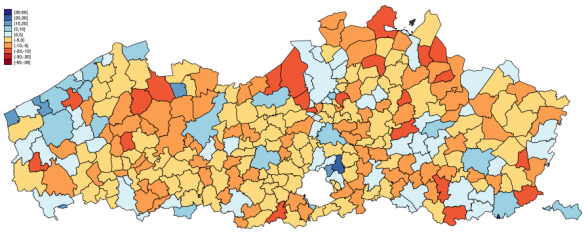


(f) SDG5 - Gender Equality

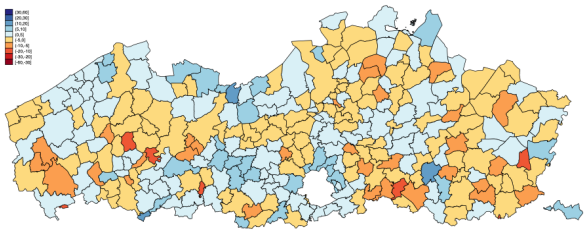


(g) SDG6 - Clean Water

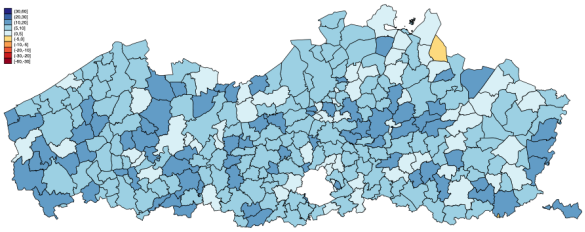
Figure 4: Absolute change in the SDG scores between 2017 and 2020



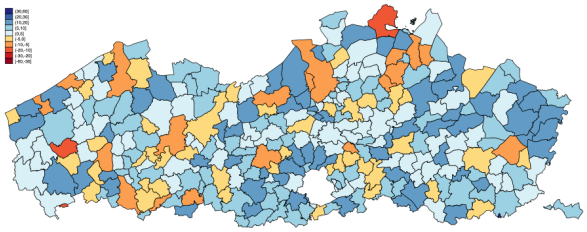
(h) SDG7 - (Affordable and Clean Energy)



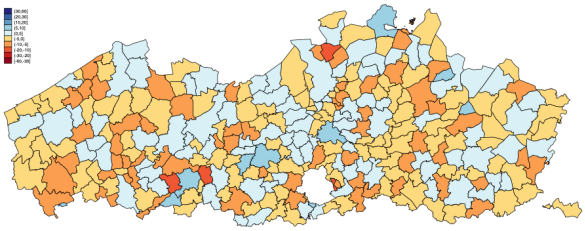
(i) SDG8 - Decent Work



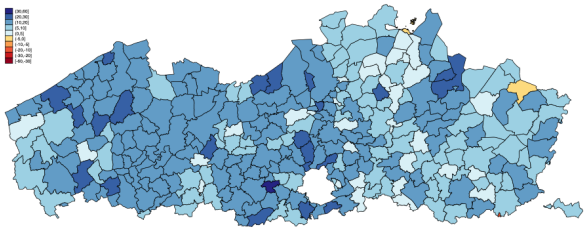
(j) SDG9 - Industry, Innovation and Infrastructure)



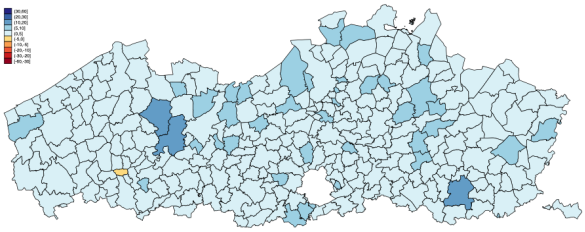
(k) SDG10 - Reduced Inequalities



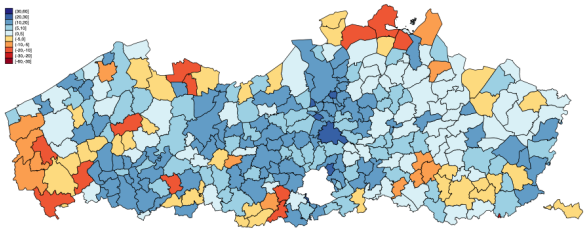
(l) SDG11 - Sustainable Cities and Communities



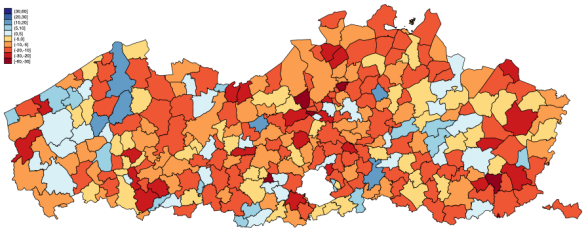
(m) SDG12 - Responsible Consumption and Production



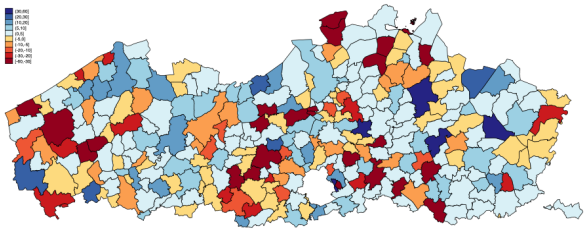
(n) SDG13 - Climate Action



(o) SDG15 - Life on Land



(p) SDG16 - Peace, Justice and Strong Institutions



(q) SDG17 - Partnership for the Goals

Figure 4: Absolute change in the SDG scores between 2017 and 2020

The change in the 13 regional cities is uniformly positive and more than double the increase of the average city (+3.0 points since 2017). This is particularly noticeable as most of these cities had among the lowest scores in 2017. In general, we see that municipalities with lower scores in 2017 are those now showing the biggest improvement. Specifically, the three lowest scoring municipalities in 2017 (Machelen, Temse and Willebroek) show increases that are larger than 90% of the sample. While this convergence pattern is statistically significant, it is not incredibly large. On average, a city whose score was 10 points lower in 2017 sees an extra increase in its score of 1.7 points in 2020.

The change in the individual SDGs is shown in the remaining panels of Figure 4. As can be expected from the previous section, they are rather diverse. *SDG2*, *SDG9*, and *SGD13* are driving the improvement of the average scores. Moreover, the last three SDGs show an almost universal improvement, with more than 99% of municipalities increasing their scores. The two objectives *SDG1* No Poverty and Peace Justice and Strong Institutions on the other hand decrease sharply by -5.7 and -8.5, respectively.

As an example of the power of these monitoring tools, we delve deeper into strong drop in the score of Peace Justice and Strong Institutions in order to determine the causes of the dip. As can be seen in Figure 5 the overall change in Peace Justice and Strong Institutions seems to be caused by a strong deterioration in the Satisfaction with Municipal Services (*SDG16e*) and the Perception of Safety (*SDG16a*). The latter happens even though the reported Incidence of Crime (*SDG16b*) keeps steadily decreasing.

4 Identifying the patterns in the indexes

The next step of our analysis involves looking at score variations between different types of regions. We consider three types of regional divisions: provinces, reference regions, and municipality clusters according to the Belfius typology (Gielens, 2018).

4.1 Provincial patterns

Table 2 lists the average scores per province on the SDGs. It shows there are differences between the provinces, some of which are statistically significant. In Antwerp, there are three SDGs where it scores above average (*SDG3*, *SDG17*, and *SDG12*), but the remaining SDGs seem to fall very close to the average. Flemish Brabant overall scores very high, mainly due to to its performance on *SDG5*, *SDG8*, and *SDG9*, although it scores relatively poorly on *SDG12* Responsible Consumption and Production. Limburg tends to score towards the middle, with one clear positive outlier (*SDG6* Clean Water and Sanitation) and two negative outliers *SDG5* Gender Equality and *SDG8* Decent Work and Economic Growth). East Flanders appears to have scores close to the middle on all SDGs. As to West-Flanders, it tends to score along the averages of most SDGs, except for *SDG13* which is higher, and *SDG3*, *SDG9*, and *SDG17* which are lower.

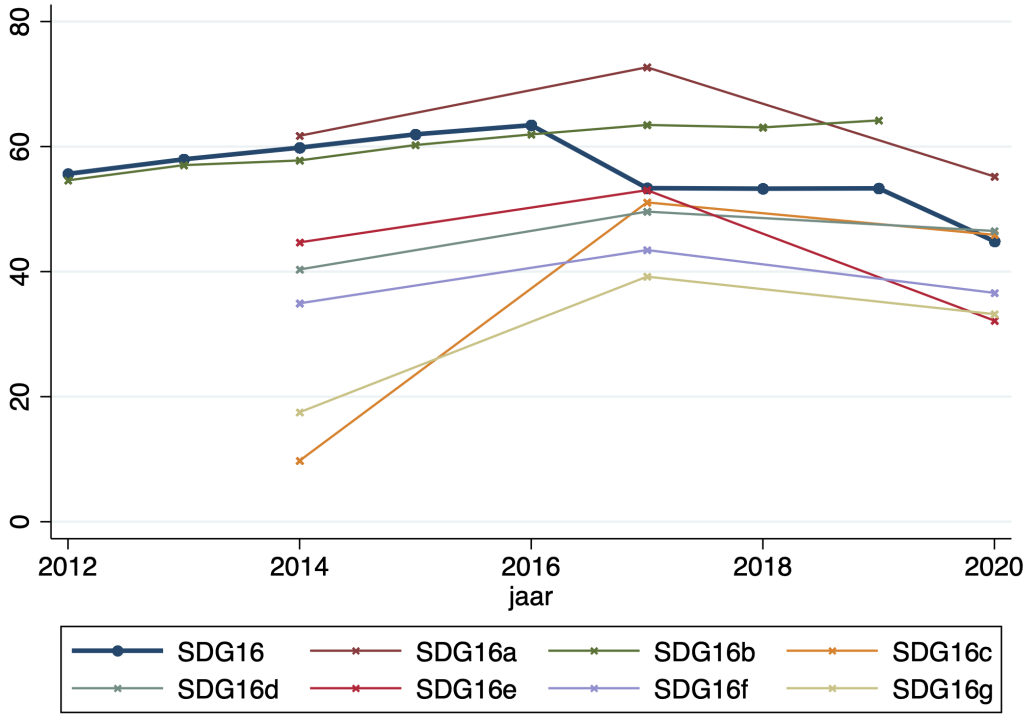
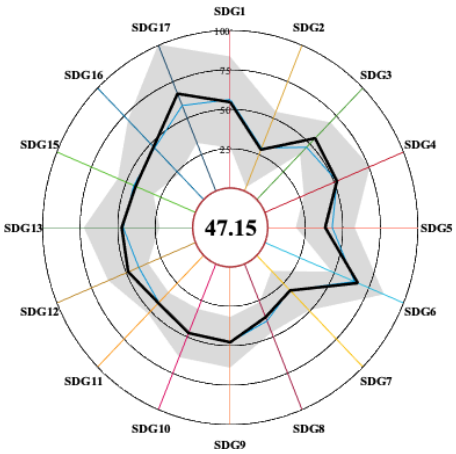


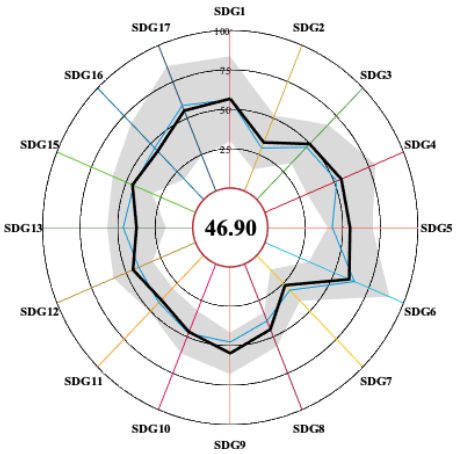
Figure 5: Detail of the absolute changes in SDG16 Peace, Justice and Strong Institutions

Note that as the survey data (SDG16 c, d, e, f and g) are only available for the 13 large cities in 2011, these changes' impact on the average score is only minimal.

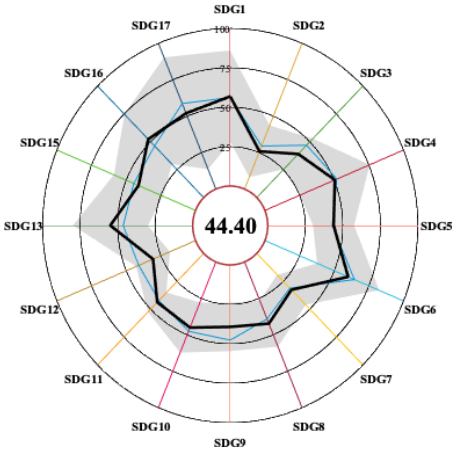
However, the differences are often very small and not economically relevant. This is especially clear when we look at the radar graphs (Figure 6). Most of the deviations from the Flemish average (the blue line) are small, particularly when compared with the variation within the scores of each province (the grey area). Many of these significant differences also disappear once we control for factors like the average income, or size of the municipality (Appendix 7). For example, Flemish Brabant's high score can be explained by the higher incomes.



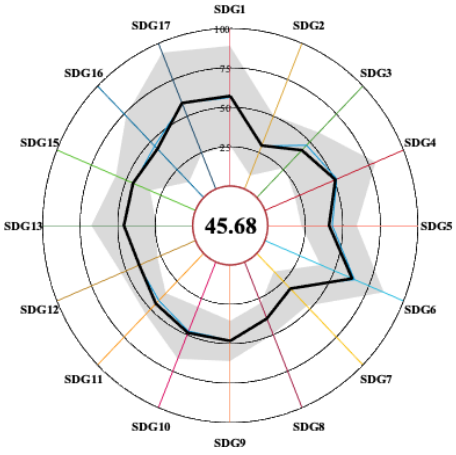
(a) Antwerp



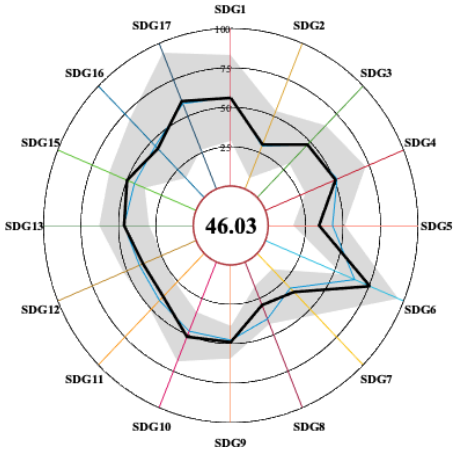
(b) Flemish-Brabant



(c) West-Flanders



(d) East-Flanders



(e) Limburg

Figure 6: Radar graph of the average score per province
The blue line represents the average score of all Flemish municipalities.

Table 2: Averages per province

	Antwerp	Flemish-Brabant	West-Flanders	East-Flanders	Limburg
SDG	47.15	46.90	44.40	45.68	46.03
SDG1	54.47	56.63	56.85	57.14	55.89
SDG2	28.43	33.35	25.88	29.87	30.56
SDG3	55.01	49.89	39.09	42.51	47.54
SDG4	51.95	55.13	50.45	50.85	50.76
SDG5	38.31	54.84	43.91	40.86	34.01
SDG6	67.05	60.83	60.04	62.93	75.60
SDG7	31.48	26.76	32.66	31.64	34.64
SDG8	36.56	44.94	42.33	38.86	29.62
SDG9	47.78	54.76	39.28	48.17	48.94
SDG10	47.47	46.73	45.07	48.70	51.38
SDG11	42.72	39.95	43.78	45.12	38.77
SDG12	48.59	45.12	30.69	40.62	38.41
SDG13	47.32	37.45	54.94	45.85	46.21
SDG15	43.20	45.51	41.17	45.11	49.97
SDG16	47.27	43.37	52.31	43.61	43.89
SDG17	66.81	55.18	52.01	59.03	60.31

4.2 Patterns in the reference regions

The reference regions further subdivide the provinces into two to five smaller regions based on the intermediary structure and regional cooperation between the municipalities. The number of municipalities ranges from seven (Region Ostend) to 33 (Halle-Villvoorde). However, as the province of Limburg is not subdivided, it is technically the largest region with 49 municipalities. Throughout this section, we will compare each region's score on the SDGs with that of Limburg in order to assess the significance of the differences between the regions.

As the upcoming sections will show, the division of Flanders into reference regions yields slightly more coherent results compared to provinces, but the underlying differences between the municipalities within a region remain relatively large. Nevertheless, about 15% of the variation in the SDG index can be attributed to regional differences, whereas it is only 5% for provincial differences.

Table 3 compares the average scores of each region with that those of Limburg. Similar to what we saw with the provinces, the differences between the regions is rather small, although there are exceptions: Kempen and East-Brabant significantly outperform Limburg, whereas the Westhoek does significantly worse. More specifically, Kempen has a significantly higher score on close to half of the SDGs, and only does worse on *SDG2* No Hunger. East-Brabant owes its higher score mostly to its performance on *SDG5* Gender Equality, and to a lesser extent to *SDG4*, *SDG8*, and *SDG9*. However, this is compensated by lower scores on *SDG6* Clean Water and Sanitation, and *SDG7* Affordable and Clean Energy. Conversely, the Westhoek has very mixed scores. On the one hand, it has particularly low scores on *SDG3*, *SDG6*, *SDG9*, and especially *SDG17*, but this is offset by rather good scores on *SDG5*, *SDG8*, *SDG13*, and *SDG16*. Most regions tend to outperform Limburg on *SDG5*, *SDG8*, and *SDG 11*, but score worse on *SDG6* Clean Water and Sanitation and *SDG15* Life on Land. Third, the regions of the Westhoek, Ostend and South-West-Flanders are the only ones who perform well on *SDG13* Climate Action.

4.2.1 Regression analysis

So far, most descriptions of the patterns in the index compared all cities to each other, regardless of their population size, income, and other such characteristics. Among other points, we saw that municipalities in East-Brabant, the richest region in Flanders, score significantly higher. Similarly, Figure 3 indicated that larger regional cities score rather poorly on the SDGs. However, in this graph, we are directly comparing municipalities like Herstappe, with less than a hundred inhabitants, to cities like Ghent and Antwerp with hundreds of thousands of inhabitants.

In this section, we try to determine the impact of the characteristics that are outside of the immediate control of a city on that city's SDG score. We do this using a regression analysis so that we can look at the average score of, e.g., being a regional city, independent of its population size, median income, etc. This allows us to determine whether the positive correlation between wealth and the SDG scores is not driven by other factors.

Table 3: Differences between the reference regions

	SDG	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SG7	SDG8
Limburg	46.03^{a}	55.89^{a}	30.56^{a}	47.54^{a}	50.76^{a}	34.01^{a}	75.60^{a}	34.64^{a}	29.62^{a}
	(0.688)	(2.662)	(2.027)	(1.451)	(2.283)	(1.422)	(2.081)	(1.497)	(1.146)
Kempen	2.92^{a}	2.18	-6.73^{b}	10.01^{a}	4.51	10.76^{a}	-5.89^{c}	2.56	4.47^{b}
	(1.10)	(4.26)	(3.24)	(2.32)	(3.65)	(2.27)	(3.33)	(2.39)	(1.83)
Reg. Antwerp	-0.11	-3.51	1.17	7.11^{a}	-1.35	-5.38^{b}	-7.98^{b}	-7.31^{a}	7.81^{a}
	(1.07)	(4.12)	(3.14)	(2.25)	(3.54)	(2.20)	(3.22)	(2.32)	(1.78)
Rivierenland	0.15	-4.27	-0.073	2.69	0.11	13.98^{a}	-15.98^{a}	-5.68^{c}	10.34^{a}
	(1.46)	(5.65)	(4.30)	(3.08)	(4.84)	(3.02)	(4.42)	(3.18)	(2.43)
Halle-Vilvoorde	-0.49	-3.63	3.60	1.29	-1.71	19.56^{a}	-11.47^{a}	-10.88^{a}	18.05^{a}
	(1.04)	(4.01)	(3.06)	(2.19)	(3.44)	(2.14)	(3.19)	(2.26)	(1.73)
East-Brabant	2.27^{b}	5.23	1.94	3.44	10.65^{a}	22.15^{a}	-18.17^{a}	-4.78^{b}	12.50^{a}
	(1.05)	(4.05)	(3.08)	(2.21)	(3.47)	(2.16)	(3.17)	(2.28)	(1.74)
Midwest	-1.94	11.16^{b}	-6.98^{c}	-3.37	5.52	10.70^{a}	-26.71^{a}	-0.49	16.70^{a}
	(1.28)	(4.96)	(3.78)	(2.70)	(4.25)	(2.65)	(3.88)	(2.79)	(2.14)
Reg. Bruges	2.01	1.66	-0.11	-7.28^{b}	4.63	14.05^{a}	-6.11	-3.07	15.05^{a}
	(1.57)	(6.07)	(4.62)	(3.31)	(5.21)	(3.24)	(4.75)	(3.42)	(2.61)
Reg. Ostend	-2.62	-12.98^{c}	5.06	-15.62^{a}	-13.93^{b}	12.07^{a}	-2.16	-4.52	3.81
	(1.82)	(7.04)	(5.36)	(3.84)	(6.04)	(3.76)	(5.51)	(3.96)	(3.03)
Westhoek	-3.40^{a}	-5.63	-6.87^{c}	-14.22^{a}	-1.69	7.11^{a}	-15.70^{a}	0.24	10.18^{a}
	(1.28)	(4.96)	(3.78)	(2.70)	(4.25)	(2.65)	(3.88)	(2.79)	(2.14)
S.W.-Flanders	-1.15	3.21	-7.59^{c}	-4.59	-2.55	8.17^{a}	-15.25^{a}	-4.60	13.77^{a}
	(1.416)	(5.476)	(4.170)	(2.985)	(4.696)	(2.925)	(4.281)	(3.080)	(2.358)
Denderregio	-2.36^{c}	-7.32	-1.67	-10.27^{a}	-6.40	7.17^{b}	-3.90	-7.42^{b}	6.80^{a}
	(1.377)	(5.324)	(4.055)	(2.903)	(4.566)	(2.844)	(4.162)	(2.995)	(2.293)
Reg. Ghent	1.29	2.75	-0.004	-2.05	1.95	5.90^{b}	-13.25^{a}	0.50	10.43^{a}
	(1.157)	(4.475)	(3.408)	(2.440)	(3.838)	(2.390)	(3.499)	(2.517)	(1.927)
Fl. Ardennen	0.803	11.55^{b}	1.078	-6.59^{b}	11.03^{b}	16.36^{a}	-24.28^{a}	-3.834	10.35^{a}
	(1.377)	(5.324)	(4.055)	(2.903)	(4.566)	(2.844)	(4.162)	(2.995)	(2.293)
Waasland	-3.21^{c}	-5.30	-3.71	-2.13	-11.59^{b}	-5.99^{c}	-6.76	-3.80	8.263^{a}
	(1.638)	(6.337)	(4.826)	(3.455)	(5.434)	(3.385)	(4.954)	(3.565)	(2.729)

	SDG9	SDG10	SDG11	SDG12	SDG13	SDG15	SDG16	SDG17
Limburg	48.94^{a}	51.38^{a}	38.77^{a}	38.41^{a}	46.21^{a}	49.97^{a}	43.89^{a}	60.31^{a}
	(1.327)	(1.525)	(0.949)	(1.261)	(2.108)	(1.232)	(2.349)	(3.155)
Kempen	-2.963	-3.981	4.391^{a}	11.45^{a}	-0.797	-2.962	8.511^{b}	11.21^{b}
	(2.121)	(2.438)	(1.517)	(2.016)	(3.369)	(1.969)	(3.755)	(5.043)
Reg. Antwerp	1.697	-3.685	2.034	9.682^{a}	0.898	-10.58^{a}	1.099	6.545
	(2.055)	(2.363)	(1.470)	(1.954)	(3.265)	(1.908)	(3.639)	(4.887)
Rivierenland	-4.249	-4.322	7.739^{a}	8.592^{a}	5.915	-5.816^{b}	-2.465	-4.158
	(2.814)	(3.235)	(2.013)	(2.676)	(4.471)	(2.613)	(4.983)	(6.692)
Halle-Vilvoorde	4.720^{b}	-8.155^{a}	0.948	3.625^{c}	-7.956^{b}	-8.228^{a}	-3.892	-3.664
	(2.000)	(2.299)	(1.431)	(1.902)	(3.177)	(1.857)	(3.541)	(4.756)
East-Brabant	6.952^{a}	-1.040	1.418	9.892^{a}	-9.586^{a}	-0.575	2.959	-6.645
	(2.018)	(2.319)	(1.443)	(1.918)	(3.205)	(1.873)	(3.572)	(4.797)
Midwest	-12.85^{a}	-12.19^{a}	6.640^{a}	-5.824^{b}	5.222	-17.81^{a}	10.41^{b}	-11.14^{c}
	(2.472)	(2.841)	(1.768)	(2.350)	(3.926)	(2.295)	(4.376)	(5.877)
Reg. Bruges	-3.122	2.608	4.508^{b}	-7.713^{a}	1.574	1.907	11.64^{b}	1.849
	(3.025)	(3.478)	(2.164)	(2.876)	(4.806)	(2.809)	(5.356)	(7.194)
Reg. Ostend	-6.716^{c}	-6.785^{c}	-0.246	-8.842^{a}	18.07^{a}	-4.092	2.620	-7.666
	(3.510)	(4.035)	(2.511)	(3.337)	(5.576)	(3.259)	(6.215)	(8.347)
Westhoek	-11.56^{a}	-3.777	3.139^{c}	-12.14^{a}	11.53^{a}	-5.637^{b}	10.54^{b}	-19.93^{a}
	(2.472)	(2.841)	(1.768)	(2.350)	(3.926)	(2.295)	(4.376)	(5.877)
S.W.-Flanders	-9.588^{a}	-8.551^{a}	8.562^{a}	-3.810	10.13^{b}	-11.94^{a}	3.701	2.468
	(2.729)	(3.137)	(1.952)	(2.595)	(4.335)	(2.533)	(4.831)	(6.489)
Denderregio	-2.509	-6.973^{b}	9.032^{a}	4.859^{c}	6.601	-6.454^{a}	-10.32^{b}	-9.011
	(2.653)	(3.050)	(1.898)	(2.523)	(4.215)	(2.463)	(4.698)	(6.309)
Reg. Ghent	0.458	1.528	5.455^{a}	-1.020	-2.551	-6.730^{a}	7.714^{c}	9.500^{c}
	(2.230)	(2.564)	(1.595)	(2.121)	(3.543)	(2.071)	(3.949)	(5.303)
Fl. Ardennen	-0.992	-1.010	4.111^{b}	0.634	-3.756	-0.834	3.512	-4.489
	(2.653)	(3.050)	(1.898)	(2.523)	(4.215)	(2.463)	(4.698)	(6.309)
Waasland	-0.825	-9.341^{b}	7.962^{a}	8.802^{a}	-0.290	-3.867	-10.96^{c}	-11.81
	(3.158)	(3.631)	(2.259)	(3.003)	(5.017)	(2.932)	(5.592)	(7.510)

Standard errors in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

In this analysis we consider the following variables. The log of the population size, the median income, the log of the surface area, whether or not the municipality is one of the 13 larger regional cities, the fraction of the population that is 80 or older and the fraction of the population that is 19 or younger. For each of the 17 SDG indexes we run the following regression:

$$\text{SDG}_i^k = \beta_1^k \text{pop}_i + \beta_2^k \text{city}_i + \beta_3^k \text{area}_i + \beta_4^k \text{income}_i + \beta_5^k \text{pop}_i^{80+} + \beta_6^k \text{pop}_i^{19-} + \delta_i^k + \epsilon_i \quad (3)$$

where the subscript i denotes the specific municipality, superscript k denotes the SDG index, δ_i is a dummy variable indicating the region and ϵ_i is a normally distributed error term with mean zero and variance σ^2.

The results of this analysis is described in Table 4. First of all, we note that the vast majority of the explanatory power of the SDG index comes from the median income. In itself, the differences in income can already explain a quarter of the variation in SDG performance.[7] In particular, we find that the richer the median resident of a municipality, the higher the score of that municipality on almost all SDGs. Although, for *SDG2* No Hunger and *SDG7* Affordable and Clean Energy this effect is not significant, and for *SDG13* Climate Action we even notice the opposite pattern: the richer the municipality, the worse it scores in terms of *SDG13* Climate Action.

Municipalities with larger populations perform not slightly but significantly, worse. In decreasing order of importance, this is due to a poorer performance on *SDG1*, *SDG4*, *SDG16*, and *SDG7*. On the other hand, Climate Action, and to a lesser extent, *SDG6* Clean Water and Sanitation, tend to be higher for municipalities with a larger population.

When looking at the individual indicators, we note that the more populous municipalities have a lower score on all the subgoals of *SDG1* No Poverty, and especially on the deprivation index and the number of people with an equivalent living wage.[8] The same is true for *SDG4* Quality Education, with the exception of the number of low-skilled unemployed which tends to be lower. As to the low score for *SDG16* Peace, Justice and Strong Institutions, it can mainly be attributed to a higher feeling of insecurity, more crime and less trust in the police.

In addition to the effect of their larger populations, the regional cities tend to score lower on *SDG1*, *SDG4*, and *SDG17*. These are compensated with higher scores on both *SDG2* No Hunger and *SDG5* Gender Equality. It is worth noting that (SDG17a) Debt Per Capita is particularly higher for major cities. Surprisingly, the higher score of cities on *SDG2* No Hunger is due to the greater share of organic farming rather than lower CO2 emissions from agriculture (the effect is not significant there). Large cities score better on all sub-goals of *SDG5* Gender Equality. This is in contrast to the more populous cities, which score significantly worse on intra-family violence and the gender gap in the employment rate.

Finally, municipalities with a larger share of elderly (80+) have a lower average SDG score. The main drivers of this effect are *SDG3* Good Health and Well-being,

[7] To be precise, leaving out the median income decreased the explained variation by half.

[8] These conclusion come from a similar regression analysis on each of the indicators. However, for the sake of brevity, we did not include these results in the paper. They are available upon request.

and to a lesser extent *SDG1* No Poverty. In contrast, municipalities with many young people have a slightly higher score. This is mostly due to *SDG17* Partnership for the Goals where both the debt ratio is lower and spending on development assistance is higher. This is, however, strongly offset by a worse score on all sub-goals of *SDG13* Climate Action.

In addition to determining these correlations, this analysis can also give a clue as to the extent to which a city government can influence its SDG performance. For example, if the variation in median income can explain all the variation in the SDGs scores, then the only real impact a city can have is by trying to raise that income. However, as we will see, while the characteristics we control for can explain a significant fraction of the variation in the scores, much remains unexplained, implying that there is considerable room for cities to make improvements. Specifically, by comparing the predicted score of a municipality to its actual score, we can identify policy areas where a municipality has a feasible path to increasing its scores.

Focusing on the reference regions, we find that the municipalities in Limburg are amongst the highest scoring. Only the Kempen have a slightly higher score, but that difference is barely significant (only at the 10% significance level). Most interesting are those regions whose relative score changes once we control for the characteristics of the municipality. In particular, even though East-Brabant has the highest average scores, its coefficient in the regression analysis becomes negative (and significant) once we control for the median income in that region. In other words, given its on average high income, we expect these municipalities to score better. Having a high score on the SDGs does not mean that there are viable paths to further increase your score. On the other end of the spectrum, the low average score of South-West Flanders in Table 3 disappears once we control for the population characteristics and median income.

Table 4: Revealing the patterns in Flemish SDG scores – reference regions

Pop. (log)	-1.68^{a}	-13.2^{a}	2.65^{c}	0.89	-10.8^{a}	-2.28^{b}	8.92^{a}	-8.38^{a}	-1.97^{b}
	(0.39)	(1.29)	(1.45)	(0.78)	(1.08)	(1.00)	(1.45)	(0.98)	(0.78)
City	-2.42^{b}	-16.9^{a}	9.87^{b}	-4.41^{c}	-12.0^{a}	10.2^{a}	-7.12^{c}	0.94	-2.06
	(1.12)	(3.76)	(4.23)	(2.25)	(3.15)	(2.90)	(4.23)	(2.84)	(2.27)
Area (log)	1.85^{a}	10.5^{a}	1.42	2.04^{b}	10.1^{a}	1.44	-6.66^{a}	5.67^{a}	4.40^{a}
	(0.40)	(1.34)	(1.50)	(0.80)	(1.12)	(1.03)	(1.50)	(1.01)	(0.81)
Med. income	0.30^{a}	0.90^{a}	0.13	0.70^{a}	0.89^{a}	0.31^{a}	0.22^{b}	0.014	0.24^{a}
	(0.023)	(0.077)	(0.087)	(0.046)	(0.064)	(0.059)	(0.087)	(0.058)	(0.047)
Pop. 80+	-0.78^{b}	-2.71^{a}	0.41	-4.27^{a}	-1.92^{b}	-0.64	-0.71	-0.41	-0.58
	(0.31)	(1.04)	(1.17)	(0.62)	(0.87)	(0.80)	(1.17)	(0.78)	(0.63)
Pop. 19-	0.40^{a}	0.84	0.76	1.25^{a}	0.87^{b}	-0.21	0.58	-0.22	1.27^{a}
	(0.15)	(0.51)	(0.58)	(0.31)	(0.43)	(0.39)	(0.58)	(0.39)	(0.31)
Kempen	1.55^{c}	-1.42	-7.10^{b}	5.83^{a}	1.18	9.68^{a}	-8.10^{b}	3.19	3.39^{b}
	(0.84)	(2.81)	(3.16)	(1.68)	(2.35)	(2.16)	(3.16)	(2.12)	(1.69)
Reg. Antwerp	-2.62^{a}	-4.41	-1.03	-1.21	-3.33	-7.46^{a}	-19.5^{a}	-0.15	7.23^{a}
	(0.98)	(3.29)	(3.70)	(1.97)	(2.75)	(2.53)	(3.70)	(2.49)	(1.99)
Rivierenland	-1.89	-4.37	-3.83	-3.82	-1.88	11.9^{a}	-24.2^{a}	-0.033	8.79^{a}
	(1.18)	(3.96)	(4.45)	(2.37)	(3.31)	(3.04)	(4.45)	(2.99)	(2.39)
Halle-Vilvoorde	-4.89^{a}	-12.4^{a}	0.91	-11.8^{a}	-10.4^{a}	17.2^{a}	-22.1^{a}	-5.94^{b}	13.7^{a}
	(1.04)	(3.49)	(3.92)	(2.09)	(2.92)	(2.69)	(3.93)	(2.64)	(2.11)
East-Brabant	-3.81^{a}	-12.0^{a}	-0.93	-10.5^{a}	-6.54^{b}	16.5^{a}	-24.3^{a}	-3.80	7.21^{a}
	(0.97)	(3.25)	(3.66)	(1.95)	(2.72)	(2.50)	(3.66)	(2.46)	(1.96)
Midwest	-0.93	15.1^{a}	-7.04^{c}	1.60	8.95^{a}	11.8^{a}	-26.9^{a}	0.46	17.5^{a}
	(1.06)	(3.57)	(4.02)	(2.14)	(2.99)	(2.75)	(4.02)	(2.70)	(2.16)
Reg. Bruges	0.17	-2.54	-2.45	-8.05^{a}	-1.36	10.3^{a}	-7.13	-2.28	14.7^{a}
	(1.24)	(4.17)	(4.68)	(2.50)	(3.48)	(3.20)	(4.68)	(3.15)	(2.51)
Reg. Ostend	-0.58	-3.68	4.47	-7.36^{b}	-6.83^{c}	11.3^{a}	-2.65	-1.85	8.10^{a}
	(1.43)	(4.80)	(5.40)	(2.88)	(4.02)	(3.70)	(5.40)	(3.63)	(2.90)
Westhoek	-2.47^{b}	-7.10^{c}	-5.68	-5.75^{b}	-2.92	8.47^{a}	-9.35^{b}	-3.68	9.93^{a}
	(1.12)	(3.77)	(4.23)	(2.26)	(3.15)	(2.90)	(4.24)	(2.85)	(2.27)
S.-W.-Flanders	-0.21	10.9^{a}	-9.00^{b}	-3.08	3.90	9.39^{a}	-20.4^{a}	0.16	14.8^{a}
	(1.14)	(3.82)	(4.29)	(2.29)	(3.20)	(2.94)	(4.30)	(2.89)	(2.31)
Denderregio	-3.53^{a}	-4.95	-4.65	-15.8^{a}	-5.50^{c}	6.43^{b}	-11.9^{a}	-1.75	5.83^{a}
	(1.09)	(3.67)	(4.13)	(2.20)	(3.07)	(2.83)	(4.13)	(2.78)	(2.22)
Reg. Ghent	-2.12^{b}	-4.98	-2.83	-9.32^{a}	-6.82^{b}	2.52	-18.6^{a}	2.97	7.68^{a}
	(0.97)	(3.26)	(3.67)	(1.96)	(2.73)	(2.51)	(3.67)	(2.47)	(1.97)
Fl. Ardennen	-2.57^{b}	0.28	0.0031	-11.1^{a}	-0.13	13.5^{a}	-25.8^{a}	-4.61	7.17^{a}
	(1.15)	(3.86)	(4.34)	(2.31)	(3.23)	(2.97)	(4.34)	(2.92)	(2.33)
Waasland	-6.01^{a}	-9.31^{b}	-8.15^{c}	-11.8^{a}	-16.8^{a}	-8.21^{b}	-12.8^{a}	-0.45	4.16
	(1.29)	(4.34)	(4.88)	(2.60)	(3.63)	(3.34)	(4.88)	(3.28)	(2.62)
Const.	-4.26	-94.3^{a}	-51	-68.5^{a}	-121^{a}	6.11	78.7^{b}	20.1	-75.9^{a}
	(8.34)	(28.0)	(31.5)	(16.8)	(23.4)	(21.6)	(31.5)	(21.2)	(16.9)
Obs.	300	300	300	300	300	300	300	300	300
R^2	0.533	0.626	0.171	0.67	0.66	0.557	0.356	0.367	0.485

Standard errors in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

	9	10	11	12	13	15	16	17
Pop. (log)	-1.58^{c}	-3.76^{a}	4.82^{a}	1.06	12.3^{a}	-5.10^{a}	-9.50^{a}	-0.88
	(0.93)	(1.03)	(0.62)	(0.84)	(1.15)	(0.80)	(1.48)	(2.31)
City	3.89	-0.081	-2.57	-7.98^{a}	-0.31	0.35	1.11	-11.7^{c}
	(2.70)	(3.00)	(1.80)	(2.44)	(3.35)	(2.32)	(4.30)	(6.72)
Area (log)	0.32	-1.25	-0.81	-0.17	-10.3^{a}	5.82^{a}	5.72^{a}	1.38
	(0.96)	(1.07)	(0.64)	(0.87)	(1.19)	(0.83)	(1.53)	(2.39)
Med. Income	0.33^{a}	0.13^{b}	0.075^{b}	0.37^{a}	-0.68^{a}	0.14^{a}	0.66^{a}	0.35^{b}
	(0.055)	(0.061)	(0.037)	(0.050)	(0.069)	(0.048)	(0.088)	(0.14)
Pop. 80+	-0.69	-0.76	-0.57	-1.19^{c}	0.50	-0.43	-1.75	3.32^{c}
	(0.75)	(0.83)	(0.49)	(0.67)	(0.92)	(0.64)	(1.19)	(1.85)
Pop. 19-	1.21^{a}	-1.20^{a}	0.097	1.30^{a}	-2.55^{a}	-0.76^{b}	0.38	2.79^{a}
	(0.37)	(0.41)	(0.24)	(0.33)	(0.46)	(0.32)	(0.59)	(0.92)
Kempen	-4.96^{b}	-4.44^{b}	3.87^{a}	8.97^{a}	1.98	-2.51	5.88^{c}	9.37^{c}
	(2.02)	(2.24)	(1.34)	(1.82)	(2.50)	(1.73)	(3.21)	(5.01)
Reg. Antwerp	-3.62	-3.87	-0.74	2.64	2.11	-5.10^{b}	-0.95	-2.53
	(2.37)	(2.62)	(1.57)	(2.13)	(2.93)	(2.03)	(3.76)	(5.88)
Rivierenland	-8.00^{a}	-2.68	4.65^{b}	3.55	7.55^{b}	-2.69	-3.49	-11.7^{c}
	(2.84)	(3.15)	(1.89)	(2.56)	(3.52)	(2.44)	(4.52)	(7.06)
Halle-Vilvoorde	-3.72	-7.19^{b}	-1.14	-6.66^{a}	2.57	-3.16	-10.5^{a}	-17.6^{a}
	(2.51)	(2.78)	(1.67)	(2.26)	(3.10)	(2.16)	(3.99)	(6.23)
East-Brabant	-1.12	-2.67	0.16	0.89	5.84^{b}	-1.09	-9.81^{a}	-18.6^{a}
	(2.34)	(2.59)	(1.55)	(2.11)	(2.89)	(2.01)	(3.72)	(5.81)
Midwest	-13.5^{a}	-11.4^{a}	8.12^{a}	-5.39^{b}	5.78^{c}	-15.3^{a}	12.4^{a}	-17.2^{a}
	(2.57)	(2.85)	(1.71)	(2.32)	(3.18)	(2.21)	(4.09)	(6.38)
Reg. Bruges	-4.09	1.17	3.77^{c}	-8.23^{a}	4.49	-0.55	7.44	-2.41
	(2.99)	(3.32)	(1.99)	(2.70)	(3.70)	(2.57)	(4.76)	(7.43)
Reg. Ostend	-4.18	-8.13^{b}	-0.0031	-4.81	10.1^{b}	-3.37	6.76	-7.20
	(3.45)	(3.83)	(2.29)	(3.11)	(4.27)	(2.97)	(5.49)	(8.57)
Westhoek	-10.5^{a}	-3.49	6.58^{a}	-9.36^{a}	16.4^{a}	-7.30^{a}	10.1^{b}	-25.9^{a}
	(2.71)	(3.00)	(1.80)	(2.44)	(3.35)	(2.33)	(4.31)	(6.73)
S.W.-Flanders	-11.0^{a}	-6.54^{b}	7.73^{a}	-5.28^{b}	7.02^{b}	-6.83^{a}	8.04^{c}	-3.09
	(2.75)	(3.04)	(1.82)	(2.48)	(3.40)	(2.36)	(4.37)	(6.82)
Denderregio	-5.50^{b}	-4.94^{c}	6.10^{a}	0.46	6.07^{c}	-2.50	-9.32^{b}	-14.6^{b}
	(2.64)	(2.93)	(1.75)	(2.38)	(3.26)	(2.27)	(4.20)	(6.55)
Reg. Ghent	-4.00^{c}	1.38	3.79^{b}	-6.35^{a}	4.80^{c}	-6.39^{a}	1.74	0.43
	(2.34)	(2.60)	(1.56)	(2.11)	(2.90)	(2.01)	(3.73)	(5.82)
Fl. Ardennen	-5.59^{b}	-2.06	4.93^{a}	-3.90	7.85^{b}	-1.55	-4.53	-15.6^{b}
	(2.78)	(3.08)	(1.84)	(2.50)	(3.43)	(2.38)	(4.42)	(6.89)
Waasland	-5.79^{c}	-6.43^{c}	5.14^{b}	2.83	6.36	-1.91	-14.1^{a}	-18.8^{b}
	(3.12)	(3.46)	(2.07)	(2.81)	(3.86)	(2.68)	(4.96)	(7.75)
Const.	4.72	126^{a}	0.61	-25.3	228^{a}	0.11	-29.9	-67
	(20.1)	(22.3)	(13.4)	(18.2)	(24.9)	(17.3)	(32.0)	(50.0)
Obs.	300	300	300	300	300	300	300	300
R^2	0.401	0.314	0.398	0.558	0.58	0.475	0.401	0.197

Standard errors in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

4.3 Patterns according to the Belfius typology of municipalities

The last territorial division we analyse is based on Belfius' typology. This groups municipalities in function of their socio-economic, demographic and geographical characteristics in order to create the most relevant reference group (Gielens, 2018). It divides the 300 Flemish municipalities into six main categories and 16 sub-categories.

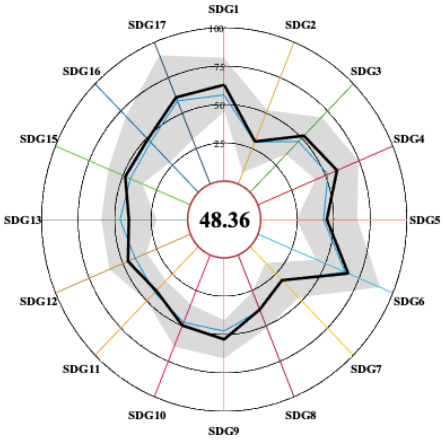
The residential municipalities form the largest group containing almost 40% of all municipalities. As such, they tend to follow the overall average patterns of SDG scores. Nevertheless, they do score slightly better on *SDG1*, *SDG4*, and *SDG12*, while scoring slightly worse on *SDG13* Climate Action. More specifically, we find that the subcategory municipalities in the suburbs with higher incomes and an increasing number of young people (1a) is the biggest outlier. The ten municipalities in that subcategory score particularly well on half of the SDGs. The residential municipalities with higher incomes (*1a 1b* and *1c*) tend to score quite poorly on *SDG13* Climate Action. This is something that we see confirmed by the regression analysis. Surprisingly, residential municipalities with an increasing number of young people are the only ones which do not score above average on *SDG4* Quality Education. However, as can be seen from column 5 of Table 4 this is likely due to other characteristics than the number of young people as this variable is positively correlated with *SDG4* Quality Education.

The second main group are the rural municipalities. These tend to score poorly on *SDG6* Clean Water and Sanitation, which is not surprising given the remoteness of most houses. On the other hand, poverty tends to be less of a problem. In line with our findings from the previous section, rural municipalities with higher incomes tend to do quite poorly on *SDG13* Climate Action.

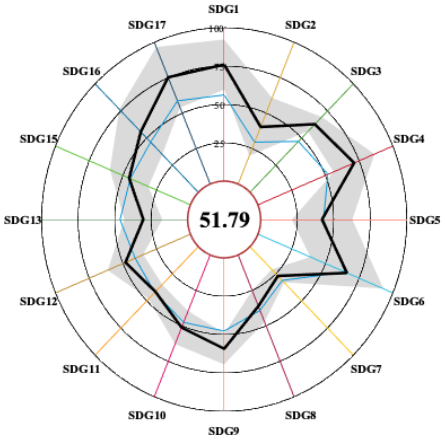
Municipalities with a high concentration of economic activity perform well on *SDG1*, *SDG9*, *SDG15*, and *SDG16*. The municipalities in the suburbs with an increasing number of young people (*3a*) tend to underperform on most SDGs, hence their lower overall score. They do compensate with a higher score on *SDG2*, *SDG8*, and *SDG17*. Those with an ageing population score noticeably better on over one third of the goals, especially *SDG1* and *SDG17*. Lastly, municipalities and small towns that act as a central hub tend to score slightly above average on most SDGs, except for *SDG13* Climate Action.

The urbanized municipalities in the fourth category score rather poorly on the SDGs, particularly the subcategory 'Well-equipped municipalities and small towns with an increasing number of young people', which has the lowest score over all categories. This particular subcategory scores below the average on 10 of the 16 SDGs, particularly on *SDG4* Quality Education and *SDG16* Peace, Justice and Strong Institutions. They compensate with a rather high score on *SDG13* Climate Action. Nevertheless, it is worth noting that if we focus on the evolution between 2017 and 2020, we find that large and regional cities and urbanized municipalities are making the most progress in the SDG monitor. Additionally, they are the cities that score best on *SDG13* Climate Action and *SDG6* Clean Water and Sanitation. Most municipalities in this category are also doing rather well in terms of *SDG5* Gender Equality.

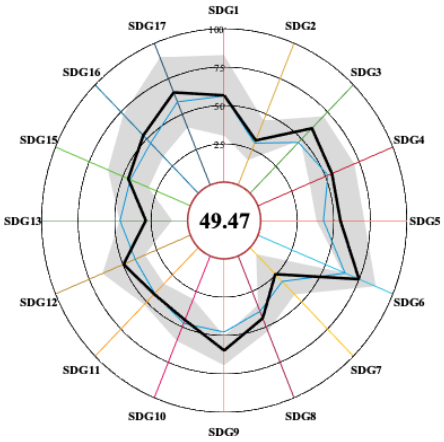
The last two main categories, ‘major and regional cities´; and ‘coastal cities´, score below average on at least half of the SDGs. In particular, the former score notably poorly on *SDG4* Quality Education and *SDG1* No Poverty, but compensate with a high score on *SDG13* Climate Action and *SDG2* No Hunger. In turn, coastal cities score particularly low on *SDG1*, *SDG3*, *SDG4*, and *SDG17*, but compensate by having the highest score of all categories on *SDG13* Climate Action and *SDG6* Clean Water and Sanitation.



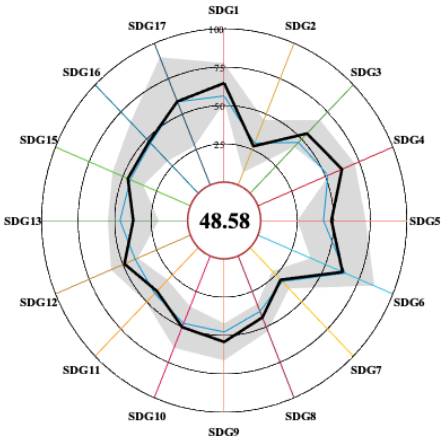
(1) Residential Municipalities



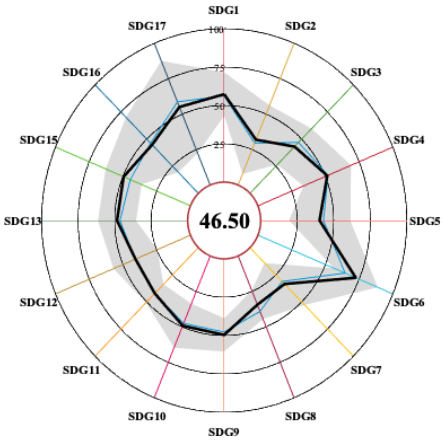
(1a) Municipalities in the suburbs with higher income levels and an increasing number of young people



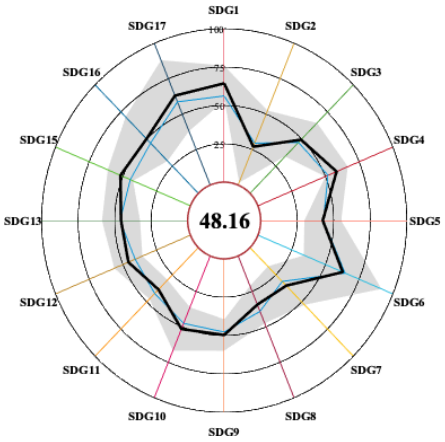
(1b) Municipalities in the suburbs with high income levels and ageing population



(1c) Residential municipalities with high income levels

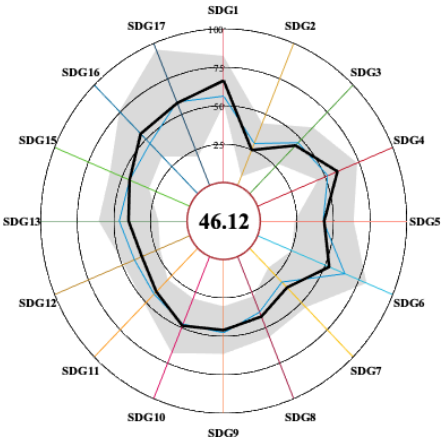


(1d) Residential municipalities with an increasing number of young people

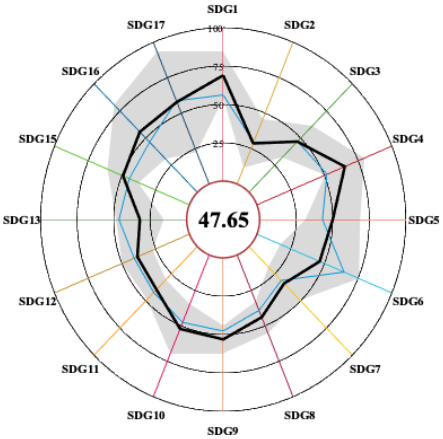


(1e) Residential municipalities with ageing population

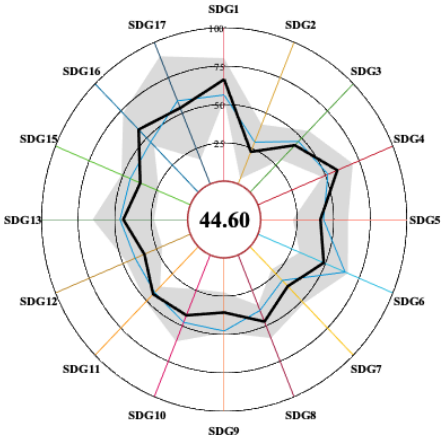
Figure 7: Averages by type of municipality (Belfius typology)



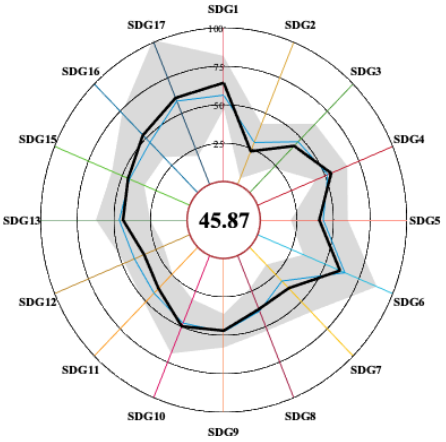
(2) Rural Municipalities



(2a) Rural residential municipalities with high income levels

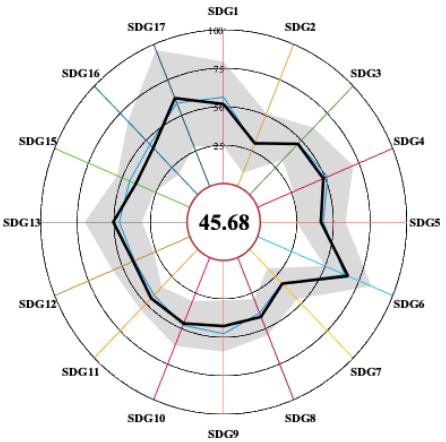


(2b) Agricultural municipalities

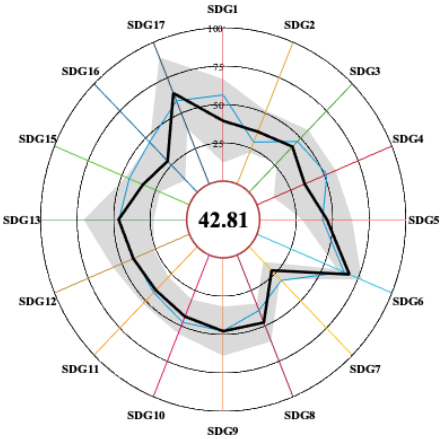


(2c) Rural residential municipalities with ageing population

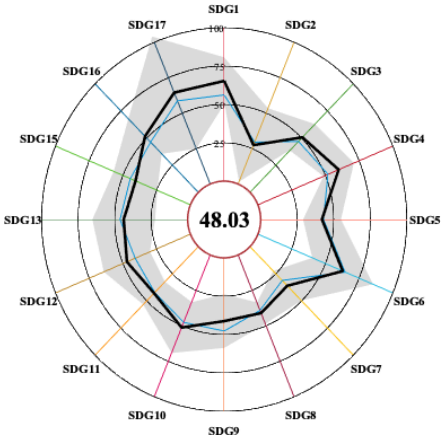
Figure 7: Averages by type of municipality (Belfius typology)



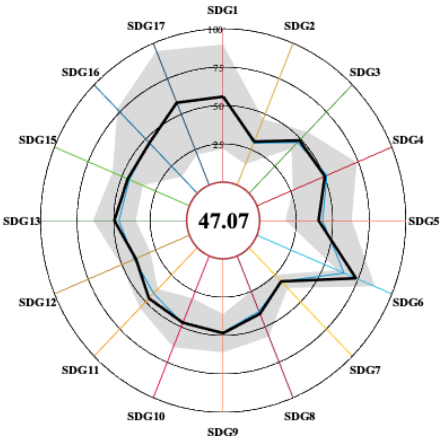
(3) Municipalities with a concentration of economic activity



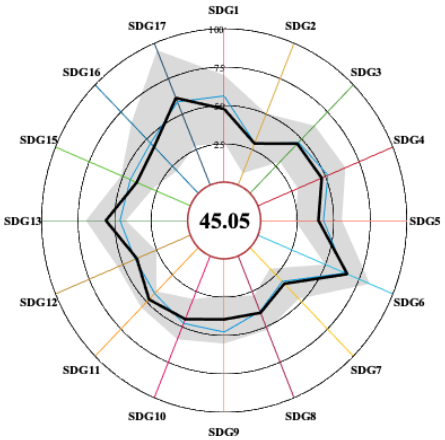
(3a) Municipalities in the suburbs with economic activity and an increasing number of young people



(3b) Municipalities with economic activity and ageing population

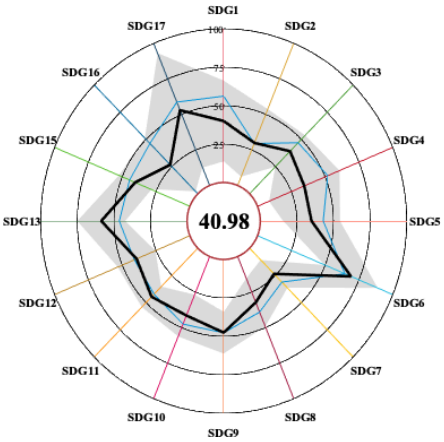


(3c) Municipalities with larger populations and economic activity

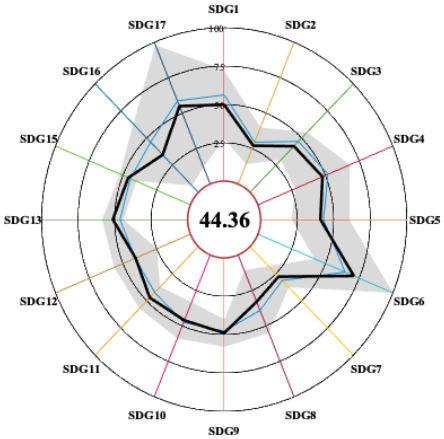


(3d) Municipalities and small towns that act as central hubs

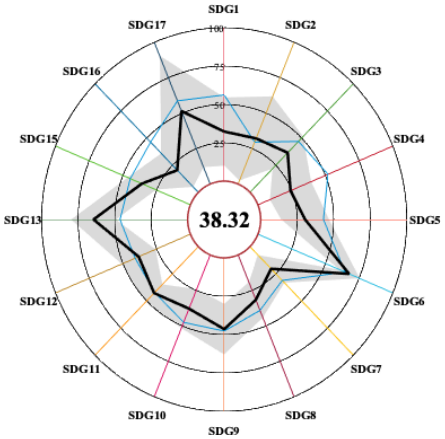
Figure 7: Averages by type of municipality (Belfius typology)



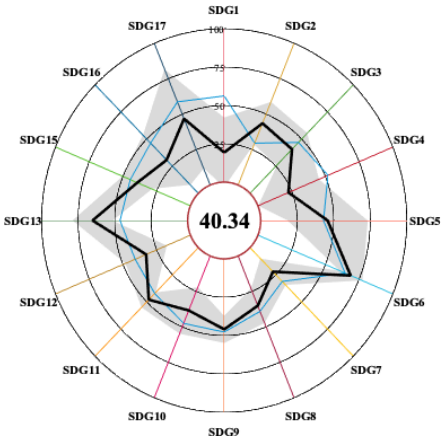
(4) Urbanised Municipalities



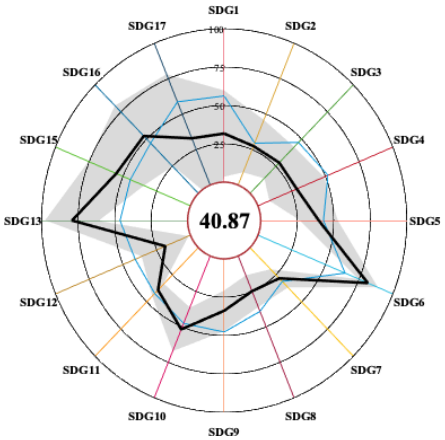
(4a) Well-equipped municipalities and small towns with ageing population



(4b) Well-equipped municipalities and small towns with an increasing number of young people



(5) Large and regional cities



(6) Coastal municipalities

Figure 7: Averages by type of municipality (Belfius typology)

5 Conclusion

This report gives an overview of the construction of the 2020 edition of the SDG index and monitor for all the Flemish cities, which is available at https://www.sdgmonitor.be. This combined effort by IDEA and UNU-CRIS provides a number of improvements on the first version. There are two key changes of note. First, this edition contains information from the 2020 household survey of three-yearly the Town and City Monitor. As this database provides more than half of the indicators in the index, this gives us an up-to-date view of the performance on a wide range of the SDGs. Second, instead of providing one snapshot of the latest available data, the new edition of the index tracks the performance of the SDGs over the last 10 years. This allows us to place the SDG performance into a wider historical context.

Overall, close to a hundred indicators are combined into 16 indexes and a summary index that allow us to gain an overall understanding of the SDG performance of all 300 Flemish municipalities. These scores express the relative position of each municipality with respect to the highest and lowest scoring municipality. This is particularly useful when trying to find municipalities that can provide a best practice in order to address those goals were scores are lagging behind.

Among the main findings, we observe that three out of four municipalities improved their average scores between 2017 and 2020, despite some variation within SDGs and their sub-goals. In particular, we find evidence of convergence between the municipalities: those with the lowest scores in 2017 are the ones that showed the biggest increase in 2020.

When looking at the geographical patterns in the index, we found the reference regions to be a more informative subdivision than the provinces. Overall, the Kempen and East-Brabant are the highest scoring regions, while the Westhoek lags behind. However, a not insignificant fraction of variation in the SDG indexes is driven by the differences in the characteristics of the municipalities, rather than their policies. The median income alone could explain close to a third of the variation in the SDG scores. When controlling for those characteristics, the Westhoek was scoring closer to its potential, while East-Brabant was slightly below what could be expected. This shows that even the highest scores on the SDGs do not mean that the full potential has been reached. There remain feasible paths that these municipalities can take to further improve their performance. While a municipality's size and median income correlate strongly with the scores, close to 50% of the variation in the SGDs is independent of these factors, indicating local policies could play an important role.

Despite the advantages of this index, there are important caveats to keep in mind. To start, the regression analyses conducted are in no way indications of causal effects, but only establish correlations. Having a high median income does not make your scores for *SGD13* Climate Action decrease, but we did find a significant correlation even when controlling for all the other characteristics. Performing a causal analysis would require detailed information on the policies that each municipality has implemented, which we are seeking to include in future editions of the index.

Secondly, because the index expresses SDG performance relative to other Flem-

ish municipalities, the scores cannot be put in a wider international context. While this would be of obvious interest, increasing the coverage of the index in this way carries with it an important caveat. As most of the indicators are only available for Flanders, finding a greater coherence with international studies would at the same time greatly reduce the richness of the dataset we have at our disposal. That being said, it would be highly interesting to expand this analysis to the other regions in Belgium and our neighbouring countries.

Finally, while we have multiple informative indicators for some of the SDGs, others remain rather anaemic and *SDG14* Life Below Water is missing entirely. Expanding the indicators and increasing their relevance remains a high priority for future versions of this index.

References

H. Aalbers. A territorial approach to the sustainable development goals: Synthesis report. Technical report, OECD Urban Policy Reviews, OECD Publishing, Paris, 2020.

G. Gielens. Typologie van de vlaamse & brusselse gemeenten 2017. Technical report, Belfius bank en verzekeringen, 2018.

G. Lafortune, K. Zoeteman, G. Fuller, R. Mulder, J. Dagevos, and G. Schmidt-Traub. The 2019 SDG index and dashboards report for european cities. Technical report, Sustainable Development Solutions Network (SDSN) and the Brabant Center for Sustainable Development (Telos): Tilburg, The Netherlands, 2019.

Standaert, Rayp, Konstantinis. The flanders city sdg index: A feasibility study. Working Paper W-2020-5, United Nations University - Institute on Comparative Regional Integration Studies, Brugge, 2020.

VVSG. SDG pilot project with local governments 2017-2019: approach and lessons learned. Technical report, Association of Flemish Cities and Municipalities, 2020.

A Full Dutch description of the indicators and their source

	SDG indicators	Source
SDG1	**No Poverty**	
1a	Aandeel van de inwoners waarvan de totale uitgave voor wonen minstens 30% bedraagt van het gezinsinkomen.	Stad-Gemeentemonitor
1b	Personen met een equivalent leefloon t.a.v. totale bevolking	Stad-Gemeentemonitor
1c	Aandeel van de inwoners dat het afgelopen jaar problemen heeft gehad om één of meerdere rekeningen (op tijd) te betalen	Stad-Gemeentemonitor
1d	Kansarmoede-index van Kind en Gezin	Stad-Gemeentemonitor
SDG2	**Zero Hunger**	
2a	Hoeveelheid CO2-emissie van de landbouw (in logs) per inwoner in de gemeente (in logs)	Provincie in cijfers
2b	Totale oppervlakte landbouw onder bio-controle (log(1+x)) ten opzichte van de totale landbouwareaal (log).	Depart. Landbouw en Visserij
SDG3	**Good Health and Wellbeing**	
3a	$\sum$ Tevredenheid voorzieningen	
3a1	Aandeel van de inwoners dat tevreden is over de gezondheidsvoorzieningen.	Stad-Gemeentemonitor
3a2	Aandeel van de inwoners dat vindt dat er in de gemeente voldoende geschikte plekken voor opgroeiende jeugd zijn.	Stad-Gemeentemonitor
3a3	Aandeel van de inwoners dat tevreden is over de ouderenvoorzieningen.	Stad-Gemeentemonitor
3b	Aandeel rechthebbenden met minstens één statuut chronische aandoening.	InterMutualistisch Agentschap
3c	Aantal verkeersslachtoffers per 1000 inwoners	Provincie in cijfers
3d	Aantal sterfgevallen per 1000 inwoners	Statbel
3e	$\sum$ Aandeel inwoners dat zich preventief laat onderzoeken op kanker	
3e1	Totale dekkingsgraad baarmoederhalskankerscreening (% vrouwen 25-64)	Provincie in cijfers
3e2	Totale dekkingsgraad borstkankerscreening (% vrouwen 50-69)	Provincie in cijfers
3e3	Totale dekkingsgraad darmkankerscreening (% 51-74-jarigen)	Provincie in cijfers
3f	Aandeel van de inwoners dat minstens wekelijks actief aan sport doet	Stad-Gemeentemonitor
3g	Aandeel rechthebbenden die met 2+ contacten met de tandarts in 2 van de 3 jaren	Stad-Gemeentemonitor
3h	Aandeel rechthebbenden met afleveringen antidiabetica of met naar diabetes verwijzende nomenclatuur	Stad-Gemeentemonitor
SDG4	**Quality Education**	
4a	Aandeel jongeren tussen 18 en 25 jaar zonder secundair diploma of kwalificatie	Stad-Gemeentemonitor
4b	Onderwijs kansarmoede-index	Stad-Gemeentemonitor

4c	Fractie laaggeschoolde niet-werkende op totaal aantal werkzoekenden	Stad-Gemeentemonitor
4d	$\sum$ Gemiddelde schoolse vertraging (naar woonplaats) lager en middelbaar	
4d1	Fractie leerlingen met minstens 1 jaar vertraging in lager onderwijs (naar woonplaats)	Stad-Gemeentemonitor
4d2	Fractie leerlingen met minstens 1 jaar vertraging in secundair onderwijs (naar woonplaats)	Stad-Gemeentemonitor
4e	$\sum$ Kwaliteit en aanwezigheid van kleuteronderwijs	
4e1	Fractie leerlingen in kleuteronderwijs met minimumaanwezigheid	Stad-Gemeentemonitor
4e2	Aandeel van de inwoners dat tevreden is over de opvang van baby's en peuters.	Stad-Gemeentemonitor

SDG5	**Gender Equality**	
5a	Werkzaamheidsgraad van vrouwen (20-64 jaar) gedeeld door de werkzaamheidsgraad van mannen (20-64 jaar)	Stad-Gemeentemonitor
5b	Aantal feiten van intrafamiliaal geweld per 10000 inwoners	Stad-Gemeentemonitor
5c	Absolute waarde van verschil in mannelijke en vrouwelijke deeltijdse tewerkstelling	Stad-Gemeentemonitor

SDG6	**Clean Water and Sanitation**	
6a	Fractie inwoners die zijn aangesloten op een riolering en lozen op een rioolwaterzuiveringsinstallatie	Stad-Gemeentemonitor
6b	Fracti inwonders die zijn aangesloten op een riolering	Stad-Gemeentemonitor
6c	Bodemafdekking: fractie oppervlakte met artificiële, (semi-)ondoorlaatbare materialen	Stad-Gemeentemonitor

SDG7	**Affordable and Clean Energy**	
7a	$\sum$ Energie-armoede huishoudens	
7a1	Aantal afsluitingen elektriciteit ten opzichte van aantal toegangspunten	VREG$^{(a)}$
7a2	Aantal afsluitingen aardgas ten opzichte van aantal toegangspunten	VREG$^{(a)}$
7a3	Aantal budgetmeters elektriciteit ten opzichte van aantal toegangspunten	Stad-Gemeentemonitor
7a4	Aantal budgetmeters aardgas ten opzichte van aantal toegangspunten	Stad-Gemeentemonitor
7b	Lokale productie groene elektriciteit t.o.v. totale elektriciteitsverbruik (max = 100%)	Provincie in Cijfers
7c	Afname in CO2-uitstoot door energie uit hernieuwbare bronnen (log) per inwoner (log)	Provincie in cijfers
7d	Aantal publieke laadpalen voor elektrische voertuigen per inwoner	Stad-Gemeentemonitor

SDG8	**Decent Work and Economic Growth**	
8a	Werkzaamheidsgraad 20-64 jaar (%)	Stad-Gemeentemonitor
8b	Nettogroeiratio van ondernemingen: (oprichtingen - stopzetting) / actieve ondernemingen	Stad-Gemeentemonitor
8c	$\sum$ Werkloosheidsgraad vrouwen, jongeren, ouderen	
8c1	Aandeel niet-werkende vrouwen van 18-64 jaar (t.o.v. vrouwen 18-64 jaar)	Provincie in Cijfers

8c2	Aandeel niet-werkende werkzoekenden van 18-24 jaar (t.o.v. inwoners 18-24 jaar)	Provincie in Cijfers
8c3	Aandeel niet-werkende werkzoekenden van 55-64 jaar (t.o.v. inwoners 55-64 jaar)	Provincie in Cijfers
8d	Aandeel niet-werkende werkzoekenden meer dan 2 jaar werkloos	Provincie in Cijfers
8e	Bruto toegevoegde waarde per werkende (€)	Stad-Gemeentemonitor
8f	Totale leegstand ten opzichte van de totale winkelvloeroppervlakte (WVO)	Provincie in Cijfers
8g	Doelgroepwerknemers min. 1 kwartaal tewerkgesteld in de sociale economie (log(1+x)) per inwoners 18-64 jaar (log)	Stad-Gemeentemonitor

SDG9	**Industry, Innovation and Infrastructure**	
9a	CO2-emissie van tertiaire sector in ton (samengeteld) per inwoner	Stad-Gemeentemonitor
9b	CO2-emissie van industrie sector in ton (samengeteld) per inwoner	Stad-Gemeentemonitor
9c	Aandeel van de inwoners dat in de woning niet beschikt over internet	Stad-Gemeentemonitor
9d	Tewerkstelling in sectoren met economisch vernieuwingspotentieel t.o.v. totale tewerkstelling	Stad-Gemeentemonitor
9e	Medium-hoogtechnologische tewerkstelling t.o.v. totale tewerkstelling	Provincie in Cijfers

SDG10	**Reduced Inequality**	
10a	$\sum$ Houding tegenover diversiteit	
10a1	Fractie inwoners dat aangeeft andere culturen niet sympathiek te vinden	Stad-Gemeentemonitor
10a2	Fractie inwoners dat vindt dat er te veel mensen van andere culturen zijn	Stad-Gemeentemonitor
10b	Inkomensongelijkheid: interkwartiele coëfficiënt	Provincie in cijfers
10c	Herkomstkloof in de werkzaamheid: Tewerkstellingen belgen vs. niet-EU burgers	Stad-Gemeentemonitor

SDG11	**Sustainable Cities and Communities**	
11a	Aandeel van de inwoners dat tevreden is over de woning.	Stad-Gemeentemonitor
11b	$\sum$ CO2 emissie openbaar vervoer en verlichting	
11b1	CO2 emissie openbaar vervoer in ton per inwoner	Provincie in cijfers
11b2	CO2 emissie openbaar verlichting in ton per inwoner	Provincie in cijfers
11c	Fractie die duurzaam verplaatst tussen woonplaats en werk, school of opleiding in de gemeente/buurt	Stad-Gemeentemonitor
11d	$\sum$ Verkeer is onveilig voor fietsers of kinderen	
11d1	Fractie die aangeeft dat het onveilig is voor de kinderen om zich te verplaatsen in de gemeente/buurt	Stad-Gemeentemonitor
11d2	Fractie die aangeeft dat het onveilig is om te fietsen in de gemeente/buurt	Stad-Gemeentemonitor
11e	Aandeel sociale woningen tav totale huishoudens	Stad-Gemeentemonitor
11f	$\sum$ Buurthinder en vanadalisme	
11f1	Fractie inwoners dat nooit/zelden wordt lastiggevallen worden op straat	Stad-Gemeentemonitor
11f2	Fractie inwoners dat nooit/zelden last heeft van burenlawaai	Stad-Gemeentemonitor
11f3	Fractie inwoners dat nooit/zelden last heeft van ander lawaai	Stad-Gemeentemonitor
11f4	Fractie inwoners dat nooit/zelden last heeft van zwerfvuil	Stad-Gemeentemonitor

11f5	Fractie inwoners dat nooit/zelden last heeft van dieren	Stad-Gemeentemonitor
11f6	Fractie inwoners dat nooit/zelden last heeft van hondenpoep	Stad-Gemeentemonitor
11f7	Fractie inwoners dat nooit/zelden last heeft van vandalisme	Stad-Gemeentemonitor
11f8	Fractie inwoners dat nooit/zelden last heeft van drugsdealing	Stad-Gemeentemonitor
11f9	Fractie inwoners dat nooit/zelden last heeft van onaangepaste snelheid	Stad-Gemeentemonitor
11f10	Fractie inwoners dat nooit/zelden last heeft van sluipverkeer	Stad-Gemeentemonitor
11g	Aandeel van de inwoners dat tevreden is over de culturele voorzieningen.	Stad-Gemeentemonitor

SDG12	**Responsible Consumption and Production**	
12a	Totale hoeveelheid restafval, uitgedrukt in kilogram per inwoner	Stad-Gemeentemonitor
12b	Fractie personenwagens met ecoscore boven 70 (uitgez. bedrijfswagens)	Stad-Gemeentemonitor
12c	Totale aantal circulaire jobs gedeeld door totaal aantal jobs per gemeente	Jobsmonitor circularaire economy
12d	Aandeel van de inwoners dat woont in een woning met energiezuinige en energierecupererende elementen.	Stad-Gemeentemonitor

SDG13	**Climate Action**	
13a	CO2-emissie door huishoudens in ton per huishouden	Stad-Gemeentemonitor
13b	CO2-emissie door particulier en commercieel vervoer per inwoner	Provincie in cijfers
13c	Energieverbruik van huishoudens [MWh] gedeeld door het aantal huishoudens	

SDG15	**Life on Land**	
15a	Gemeentelijk budget natuur- en milieubehoud, per inwoner.	Stad-Gemeentemonitor
15b	Betonsnelheid per jaar (per inwoner)	Betonrapport
15c	Onbebouwde oppervlakte op totaal gekadastreerde oppervlakte	Statbel
15d	Aandeel van de inwoners dat vindt dat er voldoende aanbod aan groen is in de buurt.	Stad-Gemeentemonitor

SDG16	**Peace, Justice and Strong Institutions**	
16a	Aandeel van de inwoners dat zich onveilig voelt in de gemeente/stad.	Stad-Gemeentemonitor
16b	Misdrijven (per 1000 inwoners)	Stad-Gemeentemonitor
16c	Aandeel van de inwoners dat weinig vertrouwen heeft in de politie	Stad-Gemeentemonitor
16d	Aandeel van de inwoners dat weinig vertrouwen heeft in de lokale overheid.	Stad-Gemeentemonitor
16e	Tevredenheid over loketvoorziening	Stad-Gemeentemonitor
16f	$\sum$ Tevredenheid over verspreiden van informatie	
16f1	Voldoende info krijgen over de geplande activiteiten	Stad-Gemeentemonitor
16f2	Voldoende info krijgen over gemaakte beslissingen	Stad-Gemeentemonitor
16f3	Voldoende info krijgen over nieuwe ingrepen.	Stad-Gemeentemonitor
16g	Tevredenheid over consultatie van inwoners	Stad-Gemeentemonitor

SDG17	**Partnerships for the Goals**	
17a	Uitgaven ontwikkelingssamenwerking gemeente en OCMW (log(1+x)) per inwoner (log)	Statistieken Vlaanderen
17b	Financiële schulden van leningen, leasings of soortgelijke overeenkomsten per inwoner	Stad-Gemeentemonitor

VREG: Vlaamse Regulator van de Elektriciteits- en Gasmarkt

B Summary statistics of the SDG indexes in 2020

Variable	Obs	Mean	Std. Dev.	Min	Max	Alpha
SDG	300	46.10	4.56	33.41	57.25	0.50
SDG1	300	56.18	17.72	0.00	100.00	0.85
SDG2	300	29.54	13.37	0.00	66.86	0.48
SDG3	300	46.96	11.31	17.24	74.43	0.74
SDG4	300	51.93	15.53	5.99	86.67	0.85
SDG5	300	43.00	12.52	6.44	79.92	0.55
SDG6	300	64.58	15.18	17.41	92.33	0.87
SDG7	300	31.18	10.29	6.31	75.00	0.61
SDG8	300	39.10	9.11	5.89	66.13	0.67
SDG9	300	47.72	10.06	18.81	68.27	0.54
SDG10	300	49.00	11.96	0.00	100	0.84
SDG11	300	42.27	6.66	3.44	56.79	0.44
SDG12	300	41.00	10.55	6.14	72.39	0.42
SDG13	300	46.36	14.85	1.50	98.83	0.77
SDG15	300	44.60	9.23	19.70	75.45	0.65
SDG16	300	46.29	16.00	5.13	86.69	0.89
SDG17	300	58.67	21.58	0.00	100.00	0.76

C Robustness check: using the geometric mean

In order to compute the index using the geometric mean, we firstly altered the standardization of the indexes. As the product of anything that is multiplied by zero will be zero, we changed the minimum value of the index from zero to one. Otherwise the change in the computation of the index is straightforward: wherever the arithmetic mean (simple average) was used before, we now use the geometric mean.

Because the geometric mean has a penalty for imbalances in the score, the average score does decrease about 12 points relative to the baseline index. However, the more pertinent question is to what extent this changes the relative position of municipalities. To that end, table 6 shows the correlation between the versions of the indexes. For most SGDs, the effect is minimal: all but two have a correlation that is higher than 85%. Only *SDG9* Industry, Innovation and Infrastructure is slightly more affected. Overall, the effect is noticeable, but small.

To better illustrate, panel (a) of Figure 8 shows the distribution of the scores on the map of Flanders, while panel (b) gives an indication of how big the difference with the baseline indexes is.

Table 5: Correlation table

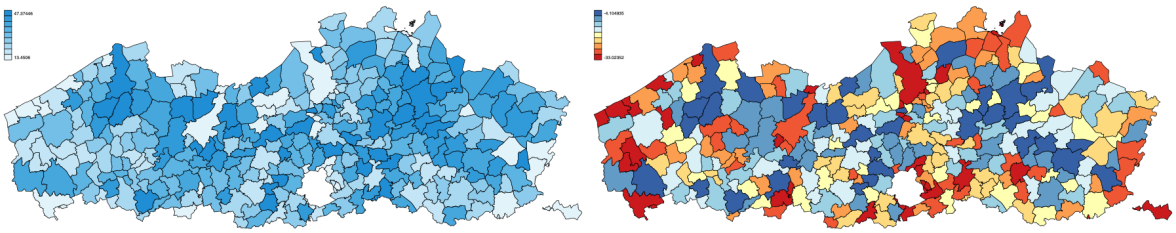
	SDG	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SDG7	SDG8
SDG	1.00								
SDG1	0.68	1.00							
SDG2	0.11	-0.14	1.00						
SDG3	0.60	0.38	-0.03	1.00					
SDG4	0.74	0.82	-0.12	0.48	1.00				
SDG5	0.35	0.24	0.13	0.05	0.32	1.00			
SDG6	0.06	-0.29	0.06	0.15	-0.29	-0.23	1.00		
SDG7	0.34	0.31	-0.19	0.00	0.31	0.02	-0.08	1.00	
SDG8	0.32	0.32	0.04	0.16	0.38	0.42	-0.35	-0.01	1.00
SDG9	0.38	0.18	0.06	0.39	0.25	0.16	0.07	-0.06	0.04
SDG10	0.23	0.13	-0.07	-0.16	0.09	0.01	0.02	0.18	-0.14
SDG11	0.05	-0.13	0.11	0.08	-0.09	-0.01	0.07	-0.08	0.10
SDG12	0.49	0.26	0.00	0.56	0.36	0.13	0.05	0.04	0.19
SDG13	-0.39	-0.56	0.00	-0.40	-0.56	-0.26	0.14	-0.09	-0.30
SDG15	0.33	0.19	0.05	0.10	0.26	0.08	0.14	0.11	-0.22
SDG16	0.62	0.54	-0.17	0.36	0.59	0.11	-0.16	0.31	0.18
SDG17	0.50	0.23	-0.01	0.23	0.16	-0.05	0.03	0.10	0.08

	SDG9	SDG10	SDG11	SDG12	SDG13	SDG15	SDG16	SDG17
SDG9	1.00							
SDG10	-0.05	1.00						
SDG11	-0.11	-0.17	1.00					
SDG12	0.38	-0.06	0.04	1.00				
SDG13	-0.32	0.07	0.28	-0.31	1.00			
SDG15	0.19	0.23	-0.16	-0.04	-0.24	1.00		
SDG16	0.08	0.11	-0.08	0.11	-0.30	0.26	1.00	
SDG17	0.07	0.14	-0.07	0.19	-0.21	-0.01	0.22	1.00

Herstappe sees by far the biggest decrease in its score when using the geometric average (-33 points). This can be traced back to the variation in its scores, which contain both the minimum (*SDG2* No Hunger) and maximum score (*SDG1* No Poverty). The municipality that sees the biggest change in its ranking Sint-Martens-Latem. Even though its score only decreases by 22 points, this is enough to drop almost 200 places from the top 50 to the bottom 100. However, for most municipalities, using the geometric mean results in only a light reshuffling, especially when looking at specific SDGs.

Table 6: Correlation between the SDG indexes when using the arithmetic vs. geometric mean

Index	Corr.	Index	Corr.
SDG	83.0%	SDG9	82.2%
SDG1	97.5%	SDG10	86.6%
SDG2	90.8%	SDG11	83.4%
SDG3	94.3%	SDG12	88.1%
SDG4	95.2%	SDG13	96.5%
SDG5	90.5%	SDG15	87.9%
SDG6	88.8%	SDG16	97.6%
SDG7	89.7%	SDG17	95.0%
SDG8	78.7%		



(a) SDG scores using geometric average

(b) Difference between the index when the arithmetic vs geometric average

Figure 8: Map of the SDG index when using geometric average

D Provincial patterns in the index

As with the reference regions (cf. section 4.2), we conduct a brief regression analysis this time controlling for the provinces. When we control for population, major cities, surface area and median income, Antwerp and Limburg score similarly, while Flemish Brabant and East and West Flanders do slightly (but significantly) worse. West-Flanders' low performance is driven by the bad performance of the Coastal cities, and without them, the difference with Antwerp is no longer significant. Moreover, it is worth noting that while the province dummies are significant, they can only explain a small part of the variation. When we look at specific SDGs in more detail, we notice that some province dummies are highly relevant. If we focus on the SDGs where a province is at least 10 points below the score of Antwerp, we observe a few interesting patterns. First, West and East Flanders score very poorly on *SDG3* Good Health and Well-being, although this seems to be mainly driven by poor scores on Chronic Disorders (West Flanders only), Sports Participation and Diabetes. Second, Flemish Brabant scores very high on *SDG5* Gender equality. The difference in the employment ratio between women and men is about as small in Flemish Brabant as West and East Flanders, but Flemish Brabant combines this with a very small difference in part-time employment of women versus men, which explains its better performance. Third, Limburg scores high on *SDG6* Clean Water and Sanitation mostly owing to a very high level of sewage and purification. Fourth, Flemish Brabant scores very poorly on *SDG16* Peace, Justice and Strong Institutions due to an underperformance on all subgoals (e.g., feeling of insecurity, trust in the police, municipal administration), with the exception of the number of crimes per population where the province does slightly better. Then, Flemish Brabant and West Flanders both score poorly on *SDG17* Partnership for the goals, mainly because of their high debt ratio. Finally, when the median income is omitted, the significant negative dummy of Flemish Brabant disappears. This implies that the province's overall higher scores is actually a function of their higher income level.

Table 7: Revealing the provincial patterns in Flemish SDG scores

									
Pop. (log)	-1.86^{a}	-12.36^{a}	3.36^{a}	0.58	-11.10^{a}	-4.07^{a}	8.367^{a}	-8.54^{a}	-0.35
	(0.37)	(1.27)	(1.29)	(0.89)	(1.05)	(1.01)	(1.39)	(0.87)	(0.78)
City	-2.39^{b}	-17.92^{a}	9.70^{b}	-5.24^{c}	-12.45^{a}	11.13^{a}	-6.94	1.26	-3.72
	(1.21)	(4.14)	(4.19)	(2.90)	(3.40)	(3.29)	(4.51)	(2.83)	(2.52)
Area (log)	1.90^{a}	8.37^{a}	0.18	1.33	9.48^{a}	3.56^{a}	-5.45^{a}	6.06^{a}	1.86^{b}
	(0.36)	(1.25)	(1.26)	(0.87)	(1.02)	(0.99)	(1.36)	(0.85)	(0.76)
Med. Income	0.23^{a}	0.70^{a}	0.12^{c}	0.40^{a}	0.73^{a}	0.25^{a}	0.09	0.02	0.12^{a}
	(0.02)	(0.07)	(0.07)	(0.05)	(0.06)	(0.06)	(0.08)	(0.05)	(0.04)
Fl.-Brabant	-2.44^{a}	-6.16^{a}	5.04^{b}	-8.18^{a}	-4.82^{a}	14.20^{a}	-5.59^{b}	-6.39^{a}	7.4^{a}
	(0.65)	(2.23)	(2.26)	(1.57)	(1.83)	(1.77)	(2.43)	(1.53)	(1.36)
W.-Flanders	-1.83^{a}	2.59	-0.76	-12.65^{a}	-1.10	5.26^{a}	-2.02	-2.95^{c}	6.19^{a}
	(0.68)	(2.33)	(2.36)	(1.64)	(1.92)	(1.85)	(2.54)	(1.60)	(1.42)
E.-Flanders	-2.46^{a}	-1.13	1.13	-13.55^{a}	-5.34^{a}	0.90	-2.41	-1.90	1.52
	(0.65)	(2.24)	(2.27)	(1.57)	(1.84)	(1.78)	(2.44)	(1.53)	(1.37)
Limburg	-0.03	2.30	3.81	-4.00^{b}	-0.36	-4.30^{b}	13.60^{a}	-1.05	-6.71^{a}
	(0.77)	(2.63)	(2.67)	(1.85)	(2.16)	(2.09)	(2.87)	(1.80)	(1.60)
Const.	6.91	-45.83^{b}	-21.65	-17.78	-83.28^{a}	-11.29	68.80^{a}	8.57	-5.01
	(5.86)	(20.10)	(20.38)	(14.11)	(16.52)	(15.99)	(21.89)	(13.75)	(12.24)
Obs.	300	300	300	300	300	300	300	300	300
R^2	0.42	0.52	0.13	0.42	0.58	0.39	0.22	0.33	0.33

								
Pop. (log)	-1.039	-4.873^{a}	4.430^{a}	1.071	10.20^{a}	-5.715^{a}	-10.53^{a}	0.793
	(0.852)	(0.954)	(0.568)	(0.831)	(1.131)	(0.761)	(1.336)	(2.130)
City	3.797	0.610	-2.646	-7.460^{a}	1.006	1.100	0.950	-11.39
	(2.767)	(3.098)	(1.844)	(2.698)	(3.674)	(2.470)	(4.340)	(6.916)
Area (log)	-0.567	0.847	-0.390	-0.515	-6.894^{a}	7.306^{a}	6.274^{a}	-1.100
	(0.833)	(0.933)	(0.555)	(0.813)	(1.106)	(0.744)	(1.307)	(2.083)
Med. Income	0.243^{a}	0.264^{a}	0.0123	0.195^{a}	-0.464^{a}	0.212^{a}	0.546^{a}	0.286^{b}
	(0.0466)	(0.0522)	(0.0311)	(0.0455)	(0.0619)	(0.0416)	(0.0731)	(0.117)
Fl.-Brabant	4.889^{a}	-3.886^{b}	-1.918^{c}	-4.997^{a}	-4.302^{b}	-0.120	-10.18^{a}	-14.10^{a}
	(1.492)	(1.671)	(0.994)	(1.455)	(1.981)	(1.332)	(2.340)	(3.730)
W.-Flanders	-6.641^{a}	-1.845	2.623^{b}	-15.65^{a}	8.684^{a}	-4.087^{a}	4.730^{c}	-11.61^{a}
	(1.559)	(1.746)	(1.039)	(1.520)	(2.070)	(1.392)	(2.446)	(3.897)
E.-Flanders	0.167	0.515	2.543^{b}	-8.062^{a}	1.566	-0.856	-6.628^{a}	-7.805^{b}
	(1.499)	(1.678)	(0.999)	(1.462)	(1.990)	(1.338)	(2.351)	(3.747)
Limburg	3.659^{b}	5.285^{a}	-2.863^{b}	-7.781^{a}	-0.634	4.355^{a}	-2.800	-2.942
	(1.760)	(1.971)	(1.173)	(1.716)	(2.337)	(1.571)	(2.761)	(4.399)
Const.	40.58^{a}	51.27^{a}	4.808	25.69^{c}	117.6^{a}	-50.30^{a}	-18.39	46.72
	(13.45)	(15.05)	(8.959)	(13.11)	(17.85)	(12.00)	(21.09)	(33.61)
Obs.	300	300	300	300	300	300	300	300
R^2	0.332	0.220	0.324	0.424	0.460	0.368	0.351	0.094

Standard errors in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

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