# Introduction

## What is the Project?

This is a project aimed towards the creation of a composite index, which is intended to evaluate countries under the question: “What makes a country more or less attractive to live in?”. It should roughly relate to the net migration of a country, and help to compare countries with each other based on their overall push/pull on migration.

### Importance to the Public

This is an important question to answer for members of countries, specifically their governmental organisations and those who would inhabitant the country. The main outcome I envision for an index like this is to support focus towards the most important areas in generating positive results for those living in a country:

* Governments can receive guidance through examining the individual aspects of a country that make up this index. Insights on how these factors impact whether people come or go will help them understand what aspects of their country are most important to support and fix, if their desire is to make it appealing to those deciding whether to move country or not.
* Many migrants compare different options in their decision to move country, trying to envision where they will be successful in settling down and building a happy life.
* Citizens of a country may desire improvement in areas important to them, if they are to consider staying in their country a comfortable and worthwhile thing to do.

### Personal Importance

The project is also fuelled by a personal curiosity in this, as I want to move out of Ireland for my own reasons. I would like to see what factors contribute to the decision of others in movement, as well as what countries seem to be most appealing overall for people to begin their new life in.

## Considered Sub-groups

From decisions based on external research and consideration of data below, I have narrowed down these sub-indices, which I expect to be most ideal.

* ECMI: Economic Migration Index - A country's push/pull for migration based on it's economic state
* ENMI: Environmental Migration Index - A country's push/pull for migration based on the current state of, and ongoing treatment of, it's environment
* PMI: Political Migration Index - A country's push/pull for migration based on it's governmental qualities
* SMI: Social Migration Index - A country's push/pull for migration based on it's demographics, and how well it supports the groups and individuals living within

Their weighting in the resulting composite index will be based on their frequency in research compared to the other sub-groups.

## Selection Criteria for Indicators

The indicators used are to be considered by experts in literature as either potential, or already determined, incoming or outgoing migratory factors. The indicators included will have the ability to be compared on the basis of entire countries, indicators focused on individuals (e.g. the reason for moving, their complex cultural attributed) will not be considered for this particular, country-wide project.

# Theoretical Framework

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| Study Name | Migration Factors Focused On | Mentioned Factors |
| Push and Pull Factors of Migration [(Parkins 2010)](https://arpejournal.com/article/119/galley/114/view/) | * Economic * Social |  |
| The environmental factor in migration dynamics – a review of African case studies [(Jónsson 2010)](https://ora.ox.ac.uk/objects/uuid:cece31bd-0118-4481-acc2-e9ca05f9a763/files/m201a6e7e1e22129ba8734247dff9dbb0) | * Environmental | * Political * Economic * Social * Cultural |
| Comparing Push and Pull Factors Affecting Migration [(Urbański 2022)](https://www.mdpi.com/2227-7099/10/1/21) | * Economic * Social * Political |  |
| The Influence of Factors of Migration on the Migration Status of Rural-Urban Migrants in Dhaka, Bangladesh [(Ishtiaque and Ullah 2013)](https://www.researchgate.net/profile/Asif-Ishtiaque/publication/258847945_The_Influence_of_Factors_of_Migration_on_the_Migration_Status_of_Rural-Urban_Migrants_in_Dhaka_Bangladesh/links/0deec5293b7fc7bcdb000000/The-Influence-of-Factors-of-Migration-on-the-Migration-Status-of-Rural-Urban-Migrants-in-Dhaka-Bangladesh.pdf) | * Social | * Economic |
| Socio-Economic Factors Associated with Urban-Rural Migration in Nigeria: A Case Study of Oyo State, Nigeria [(Adewale 2005)](https://www.researchgate.net/profile/Jacob-Adewale/publication/267716974_Socio-Economic_Factors_Associated_with_Urban-Rural_Migration_in_Nigeria_A_Case_Study_of_Oyo_State_Nigeria/links/61dffae74e4aff4a643bb5b4/Socio-Economic-Factors-Associated-with-Urban-Rural-Migration-in-Nigeria-A-Case-Study-of-Oyo-State-Nigeria.pdf) | * Social * Economic | * Cultural * Environmental * Political |
| Factors determining international and regional Migration in Europe [(Fouarge and Ester 2007)](https://cris.maastrichtuniversity.nl/ws/portalfiles/portal/913803/guid-bc2ecf8e-2d2e-4747-b70a-bf0bd8e1d9b6-ASSET1.0.pdf) | * Social * Cultural * Economic |  |

From consideration of the literature above, and how feasible it is for their listed factors may be extracted, I chose the following factors of migration, which the sub-indices would be based on:

* Economic
* Environmental
* Political
* Social

Afterwards, I conducted a deeper literature review aimed at getting an idea of the indicators related to specific factors. This is listed in further detail within the file implementing my composite index.

Once I determined the indicators I ought to use, I set out to collect this data.

# Data Selection

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# Imputation of Missing Data

# Multivariate Analysis

# Normalization

# Weighting and Aggregation

# Links to Other Indicators

# Visualization of the Results

# References

These are the references I have used throughout my project, organized by the section they feature in.

## Theoretical Framework

These are sources I looked through to determine adequate sub-indices and indicators from expert analysis of migration. For the most part, skimmed through the literature to analyse the frequency of certain indicators under determined sub-index categories.

* Dunn, J. (2020). *\*Handbook on Constructing Composite Indicators METHODOLOGY AND USER GUIDE\** [online]. Available from: https://www.researchgate.net/publication/343404133\_Handbook\_on\_Constructing\_Composite\_Indicators\_METHODOLOGY\_AND\_USER\_GUIDE [accessed 15 March 2025].
* World Bank Group. (2025). *\*World Development Indicators | DataBank\** [online]. Available from: https://databank.worldbank.org/source/world-development-indicators [accessed 1 May 2025].
* Gemini. (2025). \*Gemini - Country Attractiveness Index Data Sources\* [online]. Available from: https://g.co/gemini/share/83a744e98278 [accessed 22 March 2025].
* Adewale, JG. (2005). \*Socio-Economic Factors Associated with Urban-Rural Migration in Nigeria: A Case Study of Oyo State, Nigeria\* [online]. Available from: https://www.researchgate.net/profile/Jacob-Adewale/publication/267716974\_Socio-Economic\_Factors\_Associated\_with\_Urban-Rural\_Migration\_in\_Nigeria\_A\_Case\_Study\_of\_Oyo\_State\_Nigeria/links/61dffae74e4aff4a643bb5b4/Socio-Economic-Factors-Associated-with-Urban-Rural-Migration-in-Nigeria-A-Case-Study-of-Oyo-State-Nigeria.pdf [accessed 15 April 2025].
* Fouarge, D. Ester, P. (2007). \*Factors determining international and regional Migration in Europe\* [online]. Available from: https://cris.maastrichtuniversity.nl/ws/portalfiles/portal/913803/guid-bc2ecf8e-2d2e-4747-b70a-bf0bd8e1d9b6-ASSET1.0.pdf [accessed 15 April 2025].
* Ishtiaque, A. Ullah, S. (2013). \*The Influence of Factors of Migration on the Migration Status of Rural-Urban Migrants in Dhaka, Bangladesh\* [online]. Available from: https://www.researchgate.net/profile/Asif-Ishtiaque/publication/258847945\_The\_Influence\_of\_Factors\_of\_Migration\_on\_the\_Migration\_Status\_of\_Rural-Urban\_Migrants\_in\_Dhaka\_Bangladesh/links/0deec5293b7fc7bcdb000000/The-Influence-of-Factors-of-Migration-on-the-Migration-Status-of-Rural-Urban-Migrants-in-Dhaka-Bangladesh.pdf [accessed 15 April 2025].
* Jónsson, G. (2010). \*The environmental factor in migration dynamics – a review of African case studies\* [online]. Available from: https://ora.ox.ac.uk/objects/uuid:cece31bd-0118-4481-acc2-e9ca05f9a763/files/m201a6e7e1e22129ba8734247dff9dbb0 [accessed 15 April 2025].
* Parkins, NC. (2010). \*Push and Pull Factors of Migration\* [online]. Available from: https://arpejournal.com/article/119/galley/114/view/ [accessed 15 April 2025].
* Urbański, M. (2022). \*Comparing Push and Pull Factors Affecting Migration\* [online]. Available from: https://www.mdpi.com/2227-7099/10/1/21 [accessed 15 April 2025].
* Ayarza, A. (2025). \*Determinants of Migration Choices: The Role of Beliefs about Career and Non-Career Outcomes\* [online]. Available from: https://www.alaitzayarza.com/uploads/ayarza\_determinants\_migration.pdf [accessed 15 April 2025].
* Dustmann, C. (2001). \*Return migration, wage differentials, and the optimal migration duration\* [online]. Available from: https://www.ucl.ac.uk/~uctpb21/Cpapers/returnmigrationwage.pdf [accessed 15 April 2025].
* European Commission. (2017). \*lagging\_regions report\_en.pdf\* [online]. Available from: http://ec.europa.eu/regional\_policy/sources/studies/lagging\_regions%20report\_en.pdf [accessed 15 April 2025].
* Fafchamps, M. Shilpi, F. (2008). \*Determinants of the Choice of Migration Destination\* [online]. Available from: https://economics.ucr.edu/wp-content/uploads/2019/11/Fafchamps-paper-4-24-09.pdf [accessed 15 April 2025].
* Gemini. (2025). \*Gemini - Economic Migration Study Search Plan\* [online]. Available from: https://g.co/gemini/share/b6488c714b49 [accessed 15 April 2025].
* Gibson, J. McKenzie, D. (2009) \*The Microeconomic Determinants of Emigration and Return Migration of the Best and Brightest\* [online]. Available from: https://openknowledge.worldbank.org/server/api/core/bitstreams/e45fe478-6222-5460-a9ee-5084d5dc784e/content [accessed 15 April 2025].
* Grogger, J. Hanson, GH. (2010). \*Income maximization and the selection and sorting of international migrants\* [online]. Available from: https://www.sciencedirect.com/science/article/pii/S0304387810000647 [accessed 15 April 2025].
* Gubhaju, B. Jong, GFD. (2009). \*Individual versus Household Migration Decision Rules: Gender and Marital Status Differences in Intentions to Migrate in South Africa\* [online]. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC2727691/ [accessed 15 April 2025].
* Olney, WW. Thompson, O. (2024). \*THE DETERMINANTS OF DECLINING INTERNAL MIGRATION\* [online]. Available from: https://www.nber.org/system/files/working\_papers/w32123/w32123.pdf [accessed 15 April 2025].
* Stark, O. Bloom, DE. (1985). \*The New Economics of Labor Migration\* [online]. Available from: https://www.jstor.org/stable/1805591 [accessed 15 April 2025].
* Walker, JR. Kennan, J. (2003). \*THE EFFECT OF EXPECTED INCOME ON INDIVIDUAL MIGRATION DECISIONS\* [online]. Available from: https://www.nber.org/system/files/working\_papers/w9585/w9585.pdf [accessed 15 April 2025].
* Walker, JR. Kennan, J. (2012). \*Modeling Individual Migration Decisions\* [online]. Available from: https://users.ssc.wisc.edu/~jkennan/research/MigIzaR2.pdf [accessed 15 April 2025].
* De Haas, H. and Fransen, S. (2018). \*Social Transformation and Migration: An empirical inquiry\* [online]. Available from: https://heindehaas.org/wp-content/uploads/2018/06/wp-141-1.pdf [accessed 27 April 2025].
* Gemini. (2025). \*Gemini - Social Factors in Migration Studies\* [online]. Available from: https://g.co/gemini/share/7e2a1bcf42cc [accessed 27 April 2025].
* Heins, F. degli Uberti, S. Bonifazi, C. Crisci, M. & Paparusso, A. Pelliccia, A. De Rocchi, D. Vitiello, M. (2023). \*Drivers of International Migration\* [online]. Available from: https://www.researchgate.net/publication/372768394\_Drivers\_of\_International\_Migration [accessed 27 April 2025].
* Helliwell, J. Wang, S. Xu, J. (2015). \*How Durable are Social Norms? Immigrant Trust and Generosity in 132 Countries\* [online]. Available from: https://www.researchgate.net/publication/280482491\_How\_Durable\_are\_Social\_Norms\_Immigrant\_Trust\_and\_Generosity\_in\_132\_Countries [accessed 27 April 2025].
* Lorincz, L. Brigitta, N. (2022). \*How Social Capital is Related to Migration Between Communities?\* [online]. Available from: https://www.researchgate.net/publication/363583702\_How\_Social\_Capital\_is\_Related\_to\_Migration\_Between\_Communities [accessed 27 April 2025].
* Manchin, M. Orazbayev, S. (2018). \*Social networks and the intention to migrate\* [online]. Available from: https://growthlab.hks.harvard.edu/files/growthlab/files/cidrfwp90.pdf [accessed 27 April 2025].
* Poros, M. (2011). \*Migrant Social Networks: Vehicles for Migration, Integration, and Development\* [online]. Available from: https://www.migrationpolicy.org/article/migrant-social-networks-vehicles-migration-integration-and-development [accessed 27 April 2025].
* Salemo, J. (2016). \*Migrant decision-making in a frontier landscape\* [online]. Available from: https://sites.warnercnr.colostate.edu/jdsal/wp-content/uploads/sites/127/2020/09/Salerno-2016-Env-Res-Lett.pdf [accessed 27 April 2025].
* ScienceDirect. (2025). \*Institutional Trust - an overview | ScienceDirect Topics\* Available from: https://www.sciencedirect.com/topics/computer-science/institutional-trust [accessed 27 April 2025].
* Urbański, M. (2022). \*Comparing Push and Pull Factors Affecting Migration\* [online]. Available from: https://www.mdpi.com/2227-7099/10/1/21 [accessed 27 April 2025].
* Zanabazar, A. Kho, NS. Jigjiddorj, S. (2021). \*The Push and Pull Factors Affecting the Migration of Mongolians to the Republic of South Korea\* [online]. Available from: https://www.researchgate.net/publication/348301781\_The\_Push\_and\_Pull\_Factors\_Affecting\_the\_Migration\_of\_Mongolians\_to\_the\_Republic\_of\_South\_Korea [accessed 27 April 2025].
* - Adserà, A. Boix, C. Guzi, M. and Pytliková, M. (2016). \*Political Factors as Drivers of International Migration\* [online]. Available from: https://epc2016.eaps.nl/papers/160868 [accessed 28 April 2025].
* - Bergh, A. Mirkina, I. and Nilsson, T. (2015). \*Pushed by Poverty or by Institutions? Determinants of Global Migration Flows\* [online]. Available from: https://www.ifn.se/media/2gjjr1er/wp1077.pdf [accessed 28 April 2025].
* - ChatGPT. (2025). \*Political Factors Migration Studies\* [online]. Available from: https://chatgpt.com/share/6812a065-e1a0-800c-b6f6-6643e8025412 [accessed 30 April 2025].
* Harding, L. and Panzaru, C. (2024). \*How Transit Countries Become Refugee Destinations: Insights from Central and Eastern Europe\* [online]. Available from: https://arxiv.org/pdf/2411.08350 [accessed 30 April 2025].
* Helliwell, J. Wang, S. Xu, J. (2015). \*How Durable are Social Norms? Immigrant Trust and Generosity in 132 Countries\* [online]. Available from: https://www.researchgate.net/publication/280482491\_How\_Durable\_are\_Social\_Norms\_Immigrant\_Trust\_and\_Generosity\_in\_132\_Countries [accessed 27 April 2025].
* Poprawe, M. (2015). \*On the relationship between corruption and migration: empirical evidence from a gravity model of migration\* [online]. Available from: https://link.springer.com/article/10.1007/s11127-015-0255-x [accessed 30 April 2025].
* Rosenblum, MR. (2003). \*The Political Determinants of Migration Control: A Quantitative Analysis\* [online]. Available from: https://www.scielo.org.mx/scielo.php?pid=S1665-89062003000100007&script=sci\_arttext [accessed 30 April 2025].
* Urbański, M. (2022). \*Comparing Push and Pull Factors Affecting Migration\* [online]. Available from: https://www.mdpi.com/2227-7099/10/1/21 [accessed 28 April 2025].

## Data Selection

* [1] ChatGPT. (2025). \*Selenium SVG Scraping\* [online]. Available from: https://chatgpt.com/share/68135847-fa4c-800c-b609-f99a78e8db85 [accessed 1 May 2025].
* [2] ChatGPT. (2025). \*WB DataBank Variable Search\* [online]. Available from: https://chatgpt.com/share/6818a98a-773c-800c-89ac-61c1ea283782 [accessed 5 May 2025].
* World Bank Group. (2025). \*World Development Indicators | DataBank\* [online]. Available from: https://databank.worldbank.org/source/world-development-indicators [accessed 5 May 2025].
* International Labour Organization. (2020). \*Statistics on social dialogue - ILOSTAT\* [online]. Available from: https://ilostat.ilo.org/topics/industrial-relations/ [accessed 1 May 2025].
* UCDP. (2023). \*UCDP - Uppsala Conflict Data Program\* [online]. Available from: https://ucdp.uu.se/year/2023 [accessed 1 May 2025].
* World Bank Group. (2024). \*Home | Worldwide Governance Indicators\* [online]. Available from: https://databank.worldbank.org/source/worldwide-governance-indicators# [accessed 5 May 2025].
* World Justice Project. (2024). \*WJP Rule of Law Index\* [online]. Available from: https://worldjusticeproject.org/rule-of-law-index/global/2024/Fundamental%20Rights/table [accessed 1 May 2025].
* World Values Survey Association. (2022). \*WVS Database\* [online]. Available from: https://www.worldvaluessurvey.org/WVSOnline.jsp [accessed 1 May 2025].
* International Labour Organization. (2025). \*ILOSTAT Data Explorer\* [online]. Available from: https://rshiny.ilo.org/dataexplorer4/ [accessed 1 May 2025].
* International Monetary Fund. (2024). \*World Revenue Longitudinal Database\* [online]. Available from: https://www.imf.org/en/Topics/fiscal-policies/world-revenue-longitudinal-database [accessed 1 May 2025].
* International Telecommunication Union. (2024). \*Population coverage, by mobile network technology - ITU DataHub\* [online]. Available from: https://datahub.itu.int/data/?i=100095 [accessed 1 May 2025].
* marcelobatalhah. (2025). \*Quality of Life Index by Country 🌎🏡\* [online]. Available from: https://www.kaggle.com/datasets/marcelobatalhah/quality-of-life-index-by-country?resource=download [accessed 1 May 2025].
* World Population Review. (2025). \*Crime Rate by Country 2025\* [online]. Available from: https://worldpopulationreview.com/country-rankings/crime-rate-by-country [accessed 1 May 2025].
* Jadhav, V. (2022). \*python - Pandas dataframe to specific sheet in a excel file without losing formatting - Stack Overflow\* [online]. Available from: https://stackoverflow.com/questions/71527992/pandas-dataframe-to-specific-sheet-in-a-excel-file-without-losing-formatting [accessed 2 May 2025].
* waitingkuo. (2013). \*python - How can I iterate over rows in a Pandas DataFrame? - Stack Overflow\* [online]. Available from: https://stackoverflow.com/questions/16476924/how-can-i-iterate-over-rows-in-a-pandas-dataframe [accessed 1 May 2025].
* jL4. (2017). \*arrays - Making equal size lists in Python - Stack Overflow\* [online]. Available from: https://stackoverflow.com/questions/43336837/making-equal-size-lists-in-python [accessed 1 May 2025].
* Akram. (2021). \*python - How to determine whether a Pandas Column contains a particular value - Stack Overflow\* [online]. Available from: https://stackoverflow.com/questions/21319929/how-to-determine-whether-a-pandas-column-contains-a-particular-value [accessed 1 May 2025].
* ChatGPT. (2025). \*Updating dataframe issue\* [online]. Available from: https://chatgpt.com/share/68143640-b6b8-800c-9ff5-0f44f2d2b684 [accessed 2 May 2025].
* Nelamali, N. (2024). \*Pandas Write to Excel with Examples - Spark By {Examples}\* [online]. Available from: <https://sparkbyexamples.com/pandas/pandas-write-to-excel-with-examples/#:~:text=Use%20pandas%20to_excel()%20function,sheet%20name%20to%20write%20to> [accessed 5 May 2025].

## Imputation of Missing Data

* Herbst, S. (2022). \*Imputing Missing Values with Machine Learning-Based Approaches | by Sabrina Herbst | Medium\* [online]. Available from: https://medium.com/@sabrinaherbst/imputing-missing-values-with-machine-learning-based-approaches-373219dba314 [accessed 7 May 2025].
* Schwartz, D. (2022). \*How to Drop Rows of Pandas DataFrame Whose Value in a Certain Column is NaN\* [online]. Available from: https://www.aporia.com/resources/how-to/drop-rows-pandas-dataframe-column-vamue-nan/ [accessed 7 May 2025].
* [1] Saturn Cloud. (2023). \*How to Find All Rows with NaN Values in Python Pandas | Saturn Cloud Blog\* [online]. Available from: https://saturncloud.io/blog/how-to-find-all-rows-with-nan-values-in-python-pandas/#:~:text=To%20find%20all%20rows%20with%20NaN%20values%20in%20a%20Pandas,where%20NaN%20values%20are%20present [accessed 7 May 2025].
* [2] Saturn Cloud. (2023). \*How to Concatenate Rows of Two DataFrames in Pandas | Saturn Cloud Blog\* [online]. Available from: https://saturncloud.io/blog/how-to-concatenate-rows-of-two-dataframes-in-pandas/#:~:text=Concatenating%20rows%20of%20two%20dataframes%20in%20Pandas%20is%20a%20simple,index%20values%20that%20may%20arise [accessed 7 May 2025].
* Gemini. (2025). \*Gemini - Imputing Missing Tax Values with K-Means\* [online]. Available from: https://g.co/gemini/share/61eb79bc1e48 [accessed 7 May 2025].

## Multivariate Analysis

* [1] ChatGPT. (2025). \*Multivariate scatterplot function\* [online]. Available from: https://chatgpt.com/share/681442d6-6df8-800c-8f0c-e37562646711 (accessed 2 May 2025).
* Gemini. (2025). \*Gemini - Project Analysis: P-Values and Correlations\* [online]. Available from: https://g.co/gemini/share/3dfb4f0ac478 (accessed 2 May 2025).
* [2] ChatGPT. (2025). \*File Writing in Python\* [online]. Available from: https://chatgpt.com/share/6814f4af-05c0-800c-9800-bafaa72ab149 (accessed 2 May 2025).

## Normalization

* ChatGPT. (2025). \*Multivariate scatterplot function\* [online]. Available from: https://chatgpt.com/share/681442d6-6df8-800c-8f0c-e37562646711 (accessed 2 May 2025).

## Weighting and Aggregation

* References used

## Links to Other Indicators

* No references used for this section specifically, though technically this would feed back to the following reference in the “Data Selection” step, where I retrieved the net migration indicator:
  + World Bank Group. (2025). \*World Development Indicators | DataBank\* [online]. Available from: https://databank.worldbank.org/source/world-development-indicators [accessed 5 May 2025].

## Visualization of the Results

* Data with Dylan. (2023). \*How to Create INTERACTIVE MAPS in Python\* [online]. Available from: https://www.youtube.com/watch?v=\_xeoUYUO8Lo (accessed 4 May 2025).
* opendatasoft. (n.d.). \*World Administrative Boundaries - Countries and Territories — Opendatasoft\* [online]. Available from: https://public.opendatasoft.com/explore/dataset/world-administrative-boundaries/export/ (accessed 4 May 2025).
* Şahbaz, K. (2020). \*merge - Merging a geodataframe and pandas dataframe based on a column - Geographic Information Systems Stack Exchange\* [online]. Available from: https://gis.stackexchange.com/questions/349244/merging-a-geodataframe-and-pandas-dataframe-based-on-a-column (accessed 4 May 2025).
* Plotly. (2025). Radar charts in Python [online]. Available from: https://plotly.com/python/radar-chart/ [accessed 8 May 2025].