



Human Migration Data Visualization Report

**How many migrants are there? Where are they coming from?*

And where are they going?

**Information about each country*

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Project Website

<http://majedabu.github.io/migration.visualization/#/PRY/departures>

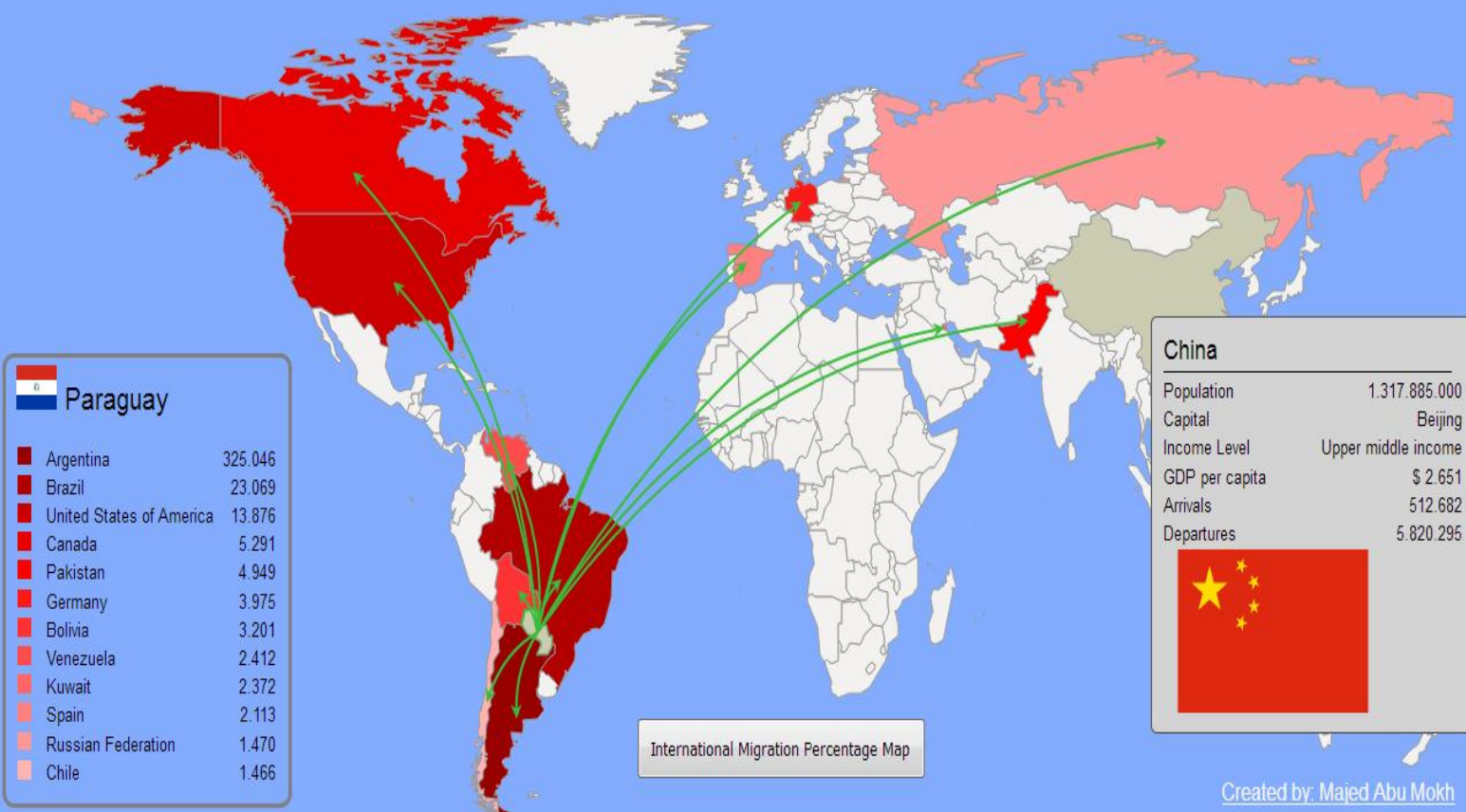
6.9.2017

Select country : Paraguay

Arrivals

Departures

People Migration
until 2007



International Migration Percentage

Arrivals

Departures

People Migration
until 2007



WHAT ?

Dataset:

1: A csv file: global_migrant_origin_database_version_4.csv, containing all the migrations number from country to country. It is really just a matrix of country-to-country migrations number, addressable by country code.

2: Code_to_world_path.json, a geojson file containing the borders data of all countries in the world, addressable by the countries code [ISO 639 format](#) (ex: BEL -> Belgium).

3: The world bank data, which provide indicators, like AIDS prevalence, for every country in the world, addressable by year and country code(json).

4: The google geolocation API, to find out the "central" coordinates of a country (the point to which arrows will be pointing when pointing to a country)(json)

5: Svg Flag Image For each Country

Dataset Type:

JSON,SVG & CSV Files.

Data Source:

* [Global migrant origin database](#) (Versio 4 Updated 2007)

* [The World Bank](#) (4 Different API)

* [SVG Flags](#)

* [Google Maps Geolocation API](#)

DATA Fields:

All the data extracted by python scripts and saved to json files

global_migrant_origin_database_version_4.csv

	H	G	F	E	D	C	B	A
	PYF	FJI	COK	ASM	NZL	AUS	State Code	Origin Countries
5	14	1521	129	6	56173	0	AUS	Australia
6	18	1410	1028	230	0	355765	NZL	New Zealand
3	1	142	31	0	402	154	ASM	American Samoa
5	1	62	0	20	15224	4742	COK	Cook Islands
33	5	0	114	153	25733	44261	FJI	Fiji
1	0	638	3	3	465	347	PYF	French Polynesia
0	3	512	68	71	33	50	GUM	Guam
1	0	265	3	3	507	407	KIR	Kiribati
51	0	167	8	9	16	18	MHL	Marshall Islands
83	1	392	18	20	29	10	FSM	Micronesia, Federated States of
0	0	36	1	1	219	465	NRU	Nauru
0	180	39	1	2	171	1074	NCL	New Caledonia
0	0	0	0	0	117	199	NFK	Norfolk Island
83	0	96	8	8	4	7	MNP	Northern Mariana Islands
1	0	7	5	6	5328	494	NIU	Niue
34	0	58	9	9	10	18	PLW	Palau
11	2	873	40	45	1153	23616	PNG	Papua New Guinea
24	4	585	84	17712	47126	13254	WSM	Samoa
1	0	73	3	4	507	1326	SLB	Solomon Islands
1	0	4	2	27	1662	262	TKL	Tokelau

From world bank(ex-> USA):

Income level and capital

```
[{"page":1,"pages":1,"per_page":50,"total":1},[{"id":"USA","iso2Code":"US","name":"United States","region":{"id":"NAC","value":"North America"},"adminregion":{"id":"","value":""},"incomeLevel":{"id":"HIC","value":"High income"},"lendingType":{"id":"LNX","value":"Not classified"},"capitalCity":"Washington D.C.,"longitude":"-77.032","latitude":"38.8895"}]]
```

GDP per capita

```
[{"page":1,"pages":1,"per_page":10,"total":1},[{"indicator":{"id":"NY.GDP.PCAP.CD","value":"GDP per capita (current US$)"},{"country":{"id":"US","value":"United States"},"value":"48061.5376613353","decimal":"1","date":"2007"}]]
```

Total Population

```
[{"page":1,"pages":1,"per_page":10,"total":1},[{"indicator":{"id":"SP.POP.TOTL","value":"Population, total"},"country":{"id":"US","value":"United States"},"value":"301231207","decimal":"0","date":"2007"}]]
```

The process used to generate the json data files:

- Run `parser_.py`, which, from `global_migrant_origin_database_version_4.csv` (provided), will generate two files:
 - `code_to_name.json`: a json object allowing to find the full English name of country corresponding to a country code in [ISO 639 format](#) (ex:USA-> United States)
 - `geoloc.json`: a json object containing the dump of all geolocalization requests sent to Google.
- Run `load_arrivals_departures` which from `global_migrant_origin_database_version_4_with_total.csv` will generate two files:
 - `code_to_arrivals.json` //for each country the total arrivals
 - `code_to_departures.json` ////for each country the total departures
- Run `arrowcomputer.py`, which, from the matrixes of migrations data generated by `parser_.py` from the csv file and the coordinates in `geoloc.json`, will generate two file per country in the 'generated' directory. Those file contains ten svg paths, one per "arrow" to be drawn on the map when clicking on the country, each one associated with the corresponding migrations number. There are two files per country: one for the incoming migrants and the other for the outgoing migrants, called for example for the USA: `inUSA.json` and `outUSA.json`. `Arrowcomputer2.py` also generates in the process the file `code_to_coordinates.json`, which is a json object/dictionary allowing to find for each country code, the corresponding central coordinates. (the map size specified in `geojsontosvg.py` is used to compute the size and positioning of the arrows).
- Run `geojsontosvg.py`, which, from `world.json` and a map size (specified directly in the file), will generate the file `world_svg_paths.json`, which is a json object allowing to get, for each full English country name , the borders in as svg paths.
- Run `worldBankDataGetter.py` to download the indicators data from the world bank api and store them in json files : GDP per capita (`GDP.json`), and population size (`POP.json`),Country capital (`capital.json`) ,Income Level (`incomeLevel.json`)

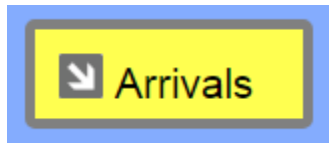
More information about the main data " Global Migrant Origin Database "

The global data base of the Development Research Centre on Migration, Globalisation and Poverty (Migration DRC) consists of a 226x226 matrix of origin-destination stocks by country and economy. The data are generated by disaggregating the information on migrant stock in each destination country or economy as given in its census. The reference period is the 2000 round of population censuses, so the data do not refer to precisely the same time period. They are stocks not population flows in a strict sense but are, for international migration, the equivalent of "lifetime migration" in studies of internal migration. Four versions of the database are currently available, giving increasing levels of completeness, but decreasing levels of accuracy as the missing data are added via assumption and interpolation with each successive version. Users of the higher numbered versions should be aware of the limitations that this imposes. The four versions are described in the table below. In the first three versions, information is reported on both place of birth and citizenship, compiled in separate matrices (see tabs on each sheet), to maintain the clear distinction between the data, which are clearly based on different concepts. Version 4 combines the two concepts to create a single complete bilateral matrix of stocks.

SOFTWARE DEVELOPMENT TOOLS:

- **Raphael**
- **Hasher**
- **Python**
- **HTML**
- **JavaScript**
- **CSS**
- **JQuery**
- **D3**
- **Json**

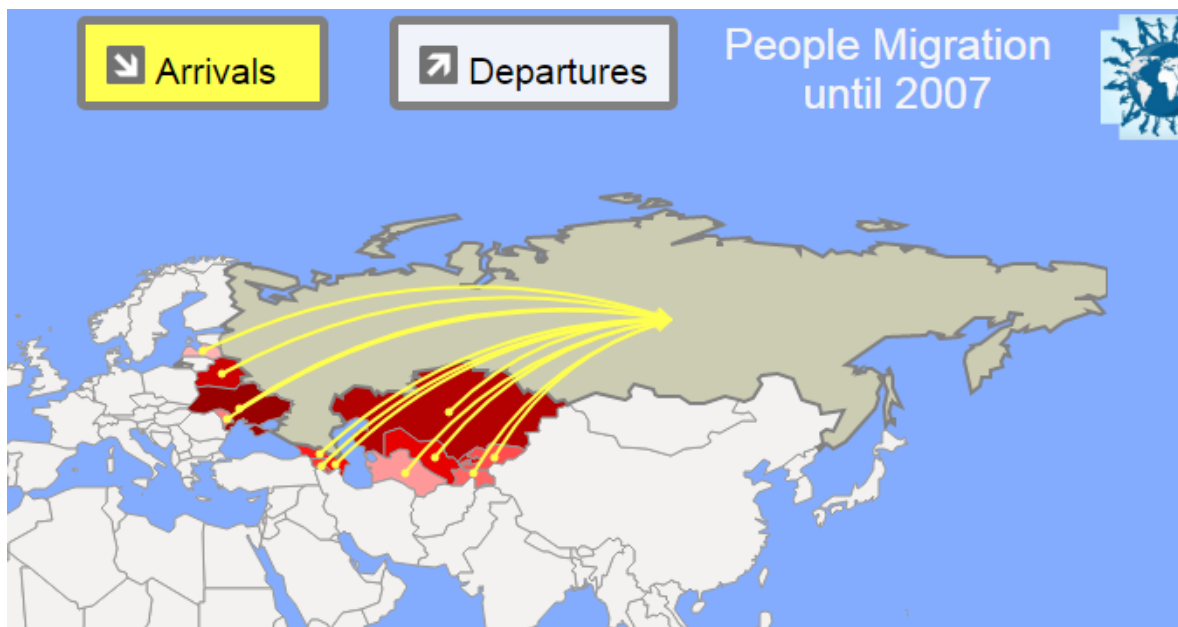
Main Fields :



By Pressing the yellow bottom "Arrivals" it will show the 12 countries by order (number of immigrants) that arrived to the chosen country, pointed by yellow arrows.

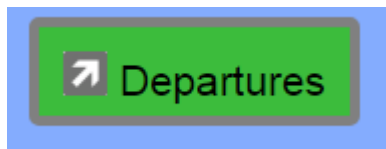
The Darker the color "More Red" The more immigrants arrived from this country.

Ex->Russ



 Russian Federation	
 Ukraine	3.559.975
 Kazakhstan	2.584.955
 Belarus	935.782
 Uzbekistan	918.037
 Azerbaijan	846.104
 Georgia	628.973
 Armenia	481.328
 Kyrgyzstan	463.521
 Tajikistan	383.057
 Moldova, Republic of	277.527
 Turkmenistan	175.252
 Latvia	102.518

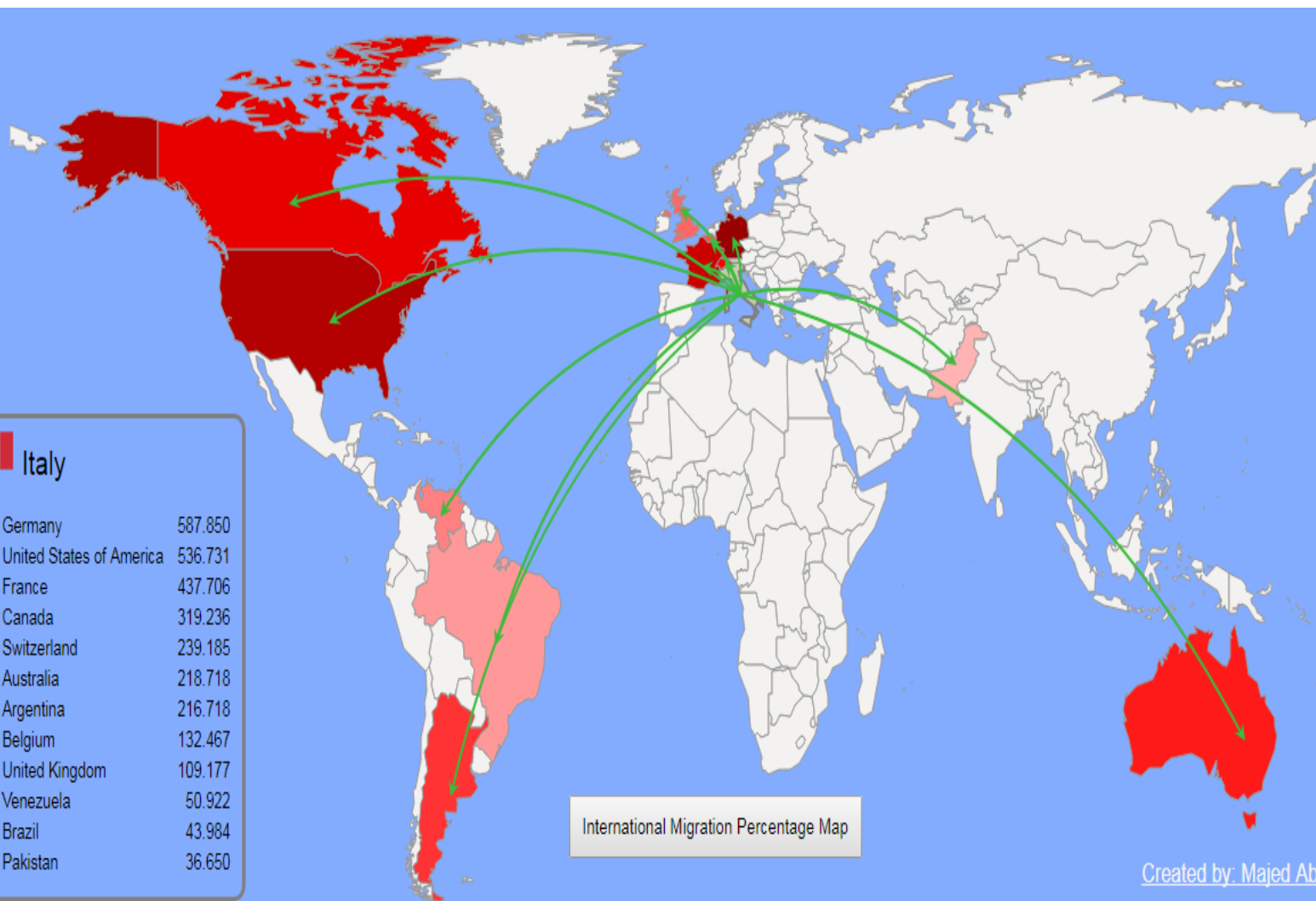
" The Darker the color
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immigrants arrived from
this country."

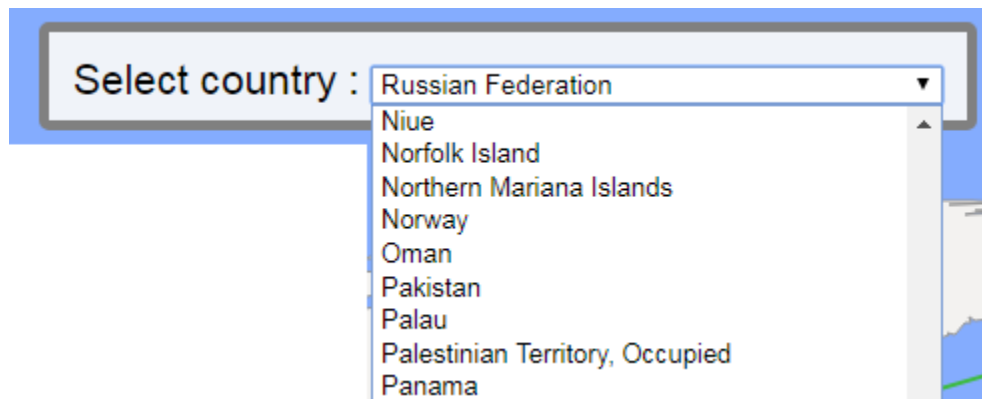


By Pressing the green bottom "Departures" it will show the 12 countries by order (number of immigrants) that depart to the countries, pointed by green arrows.

The Darker the color "More Red" The more immigrants depart to this country.

Ex-> Italy

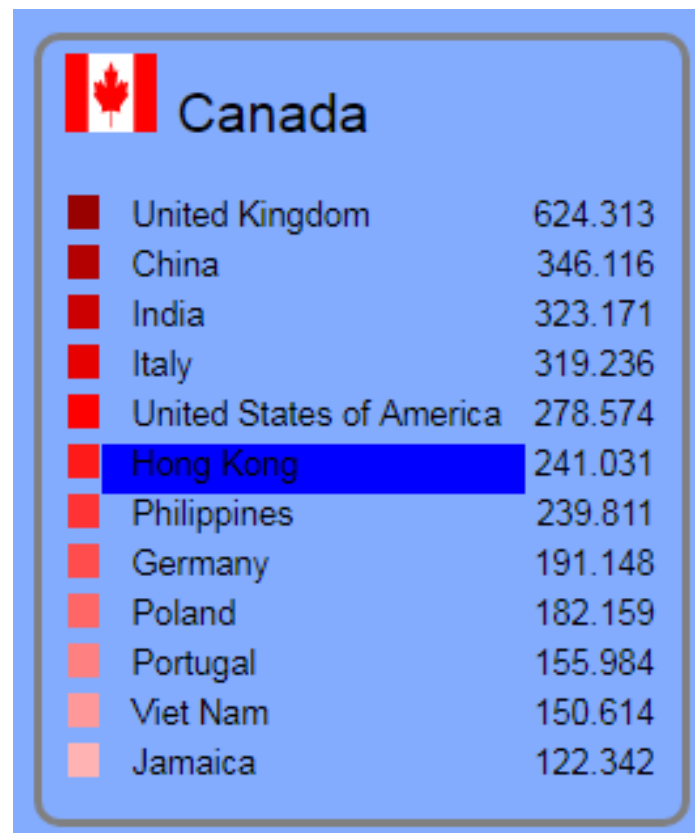




User can select country by choosing from the menu OR click in the map.

The Darker the color
"More Red" The more
immigrants
arrived/depart from/to
the country.

The user can also click on
each one of them and
will display their data(it
will be the current
country)



Fields Displayed on point hover :



title: String

Name of the Country

Capital: String

Country capital

Income level: String

Threshold	GNI/Capita (current US\$)
Low-income	< 1,005
Lower-middle income	1,006 - 3,955
Upper-middle income	3,956 - 12,235
High-income	> 12,235

GDP per capita: number

GDP per capita is a measure of a country's economic output that accounts for population. It divides the country's gross domestic product by its

total population. That makes it the best measurement of a country's standard of living. It tells you how prosperous a country feels to each of its citizens.

Arrivals: number

The total Arrivals for a country

Departures : number

The total Departures for a country

Flag : Svg image

The National flag for a country

WHY ?

Discover association: user can discover if there is **association** between Income level , GDP per capita and the number of arrivals and departures . for example USA
Income level is high - GDP is high
->>arrivals high & departures low

Enjoy: User will enjoy displaying the data, responsive design, eye candy UI, simple and minimalist design and colors.

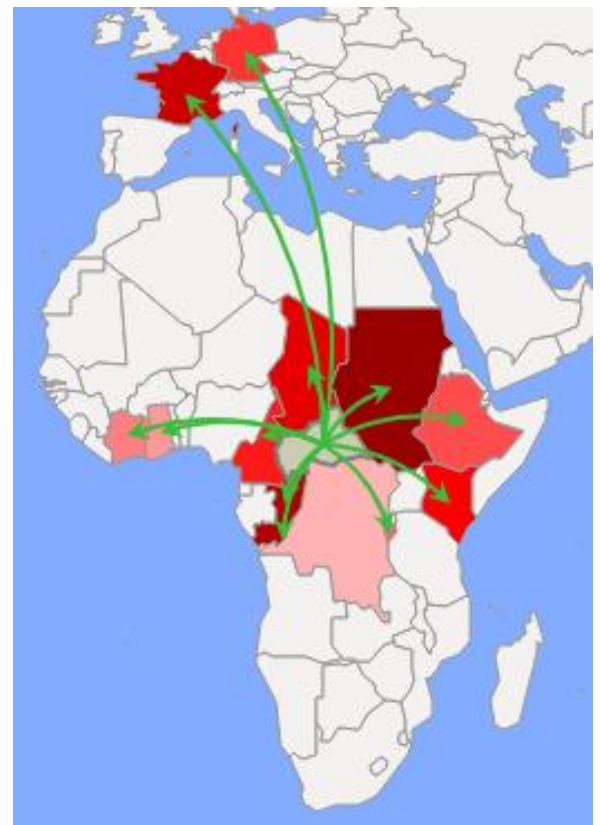

Tracing :

According to the map the user can see for each country where each migrates prefer to immigrates

*example many countries - migrators immigrate to near by countries.

Compare Countries: User can compare between different countries that have historical relation .

United States of America	
Population	301.580.000
Capital	Washington D.C.
Income Level	High income
GDP per capita	\$ 46.406
Arrivals	34.634.797
Departures	2.247.110



HOW ?

Color of choosed countries: I used 12 colors (most light red to most dark red) to show the different degree of migrators number for each country

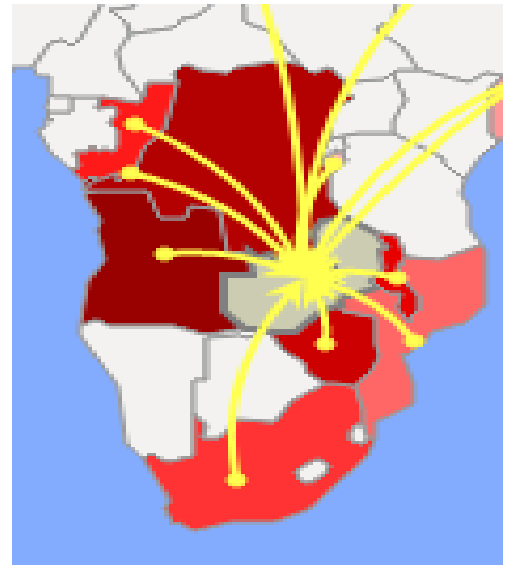
Motion: I choose to use arrow (green for Depatures ,Yellow for arrivals) to help the user differ between Arrivals and Depatures migrators countries, it show also the distance between the countries.

Mouse hover for each country to show the "popup" Important information for each hover country.

Legend: showing the estimated numbers of migrators from departures or arrivals countries in order.

Background color: I choose one color for the map, light blue, I tried different colors and decided it is the most suitable in our case, for the country I choose light gray color. It seems like google maps.

It doesn't interface with the arrows displayed color or the popup(country information), it make the map clear and simple.



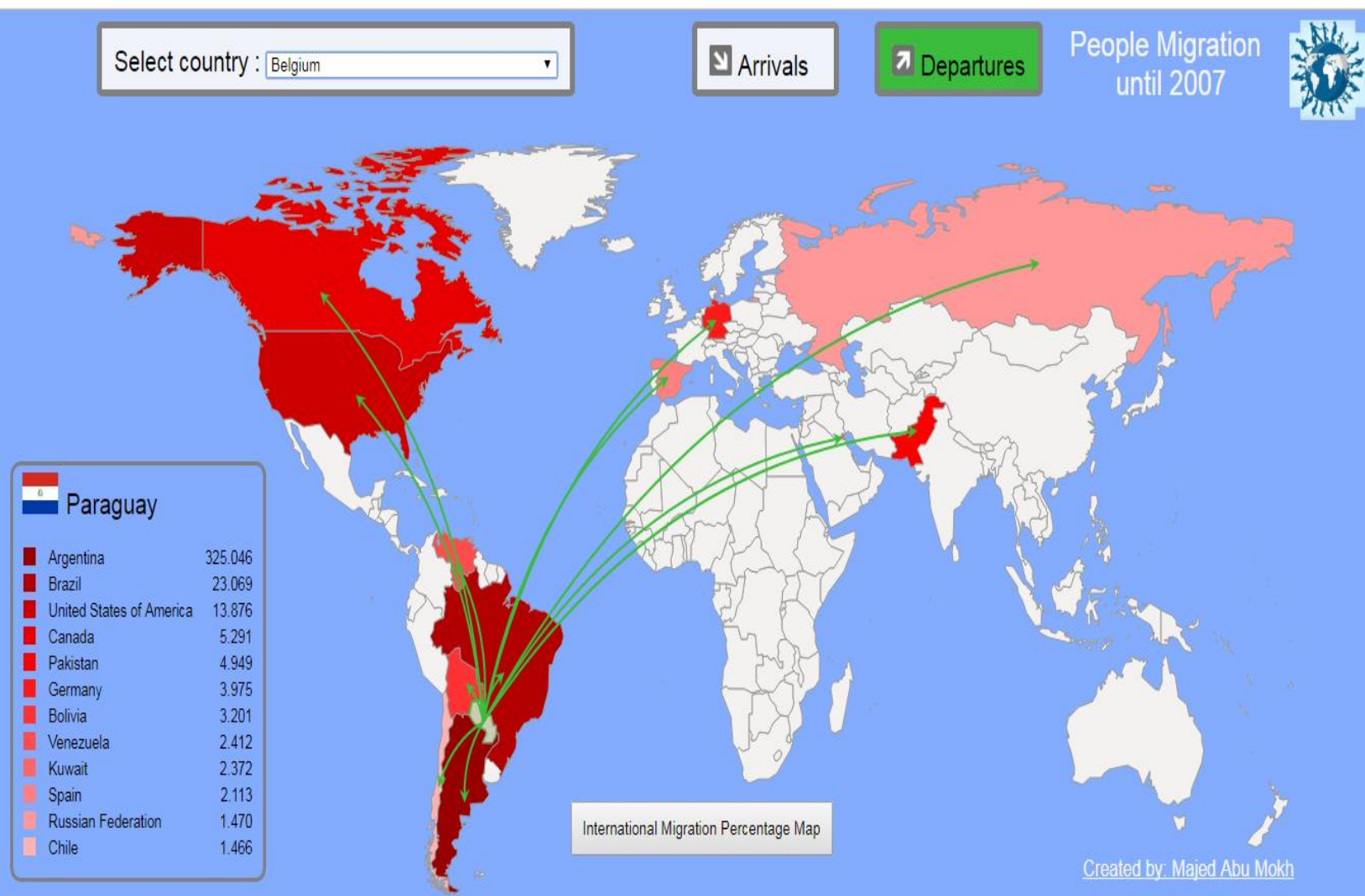
Zambia		
Angola		153.327
Congo, the Democratic Republic of the		75.392
Zimbabwe		37.763
Malawi		28.635
India		14.356
Congo		7.378
South Africa		7.299
United Kingdom		4.388
Mozambique		3.993
Eritrea		3.135
Somalia		2.959
Burundi		2.278



User tasks:

Explore: When the user enters the site, he sees the visualization immediately, so he can simply start exploring the human migration for each country. With the legend ON by default (Paraguay), it is easier to understand what the arrows mean, color of the chosen country (light red to dark red).

The main view of the website. (Paraguay Departures arrow)



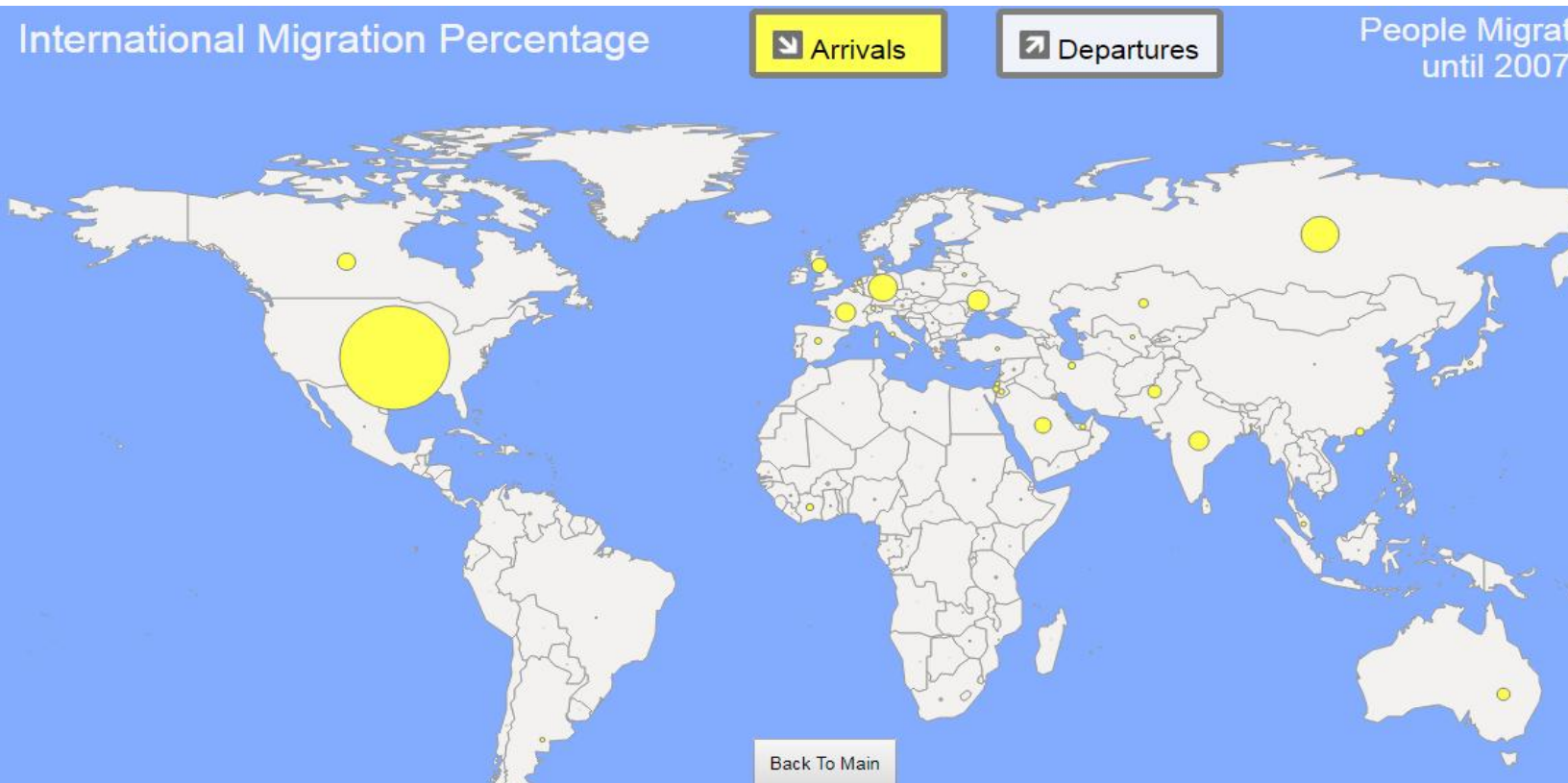
Bonus

International Migration Percentage Map

By Pressing the bottom "International migration percentage map" it will show World map migration percentage (circles) for each country

Arrivals:

Radius of circles = total arrivals for a country divided by the max total arrivals in the world (USA – 34 millions) then multiplied by a constant($\alpha=40$)



We can see that most immigrants prefer USA-Canada-Germany-France-India-Saudi Arabia

All these countries share a "high" level income and GDP per capita

Departures:

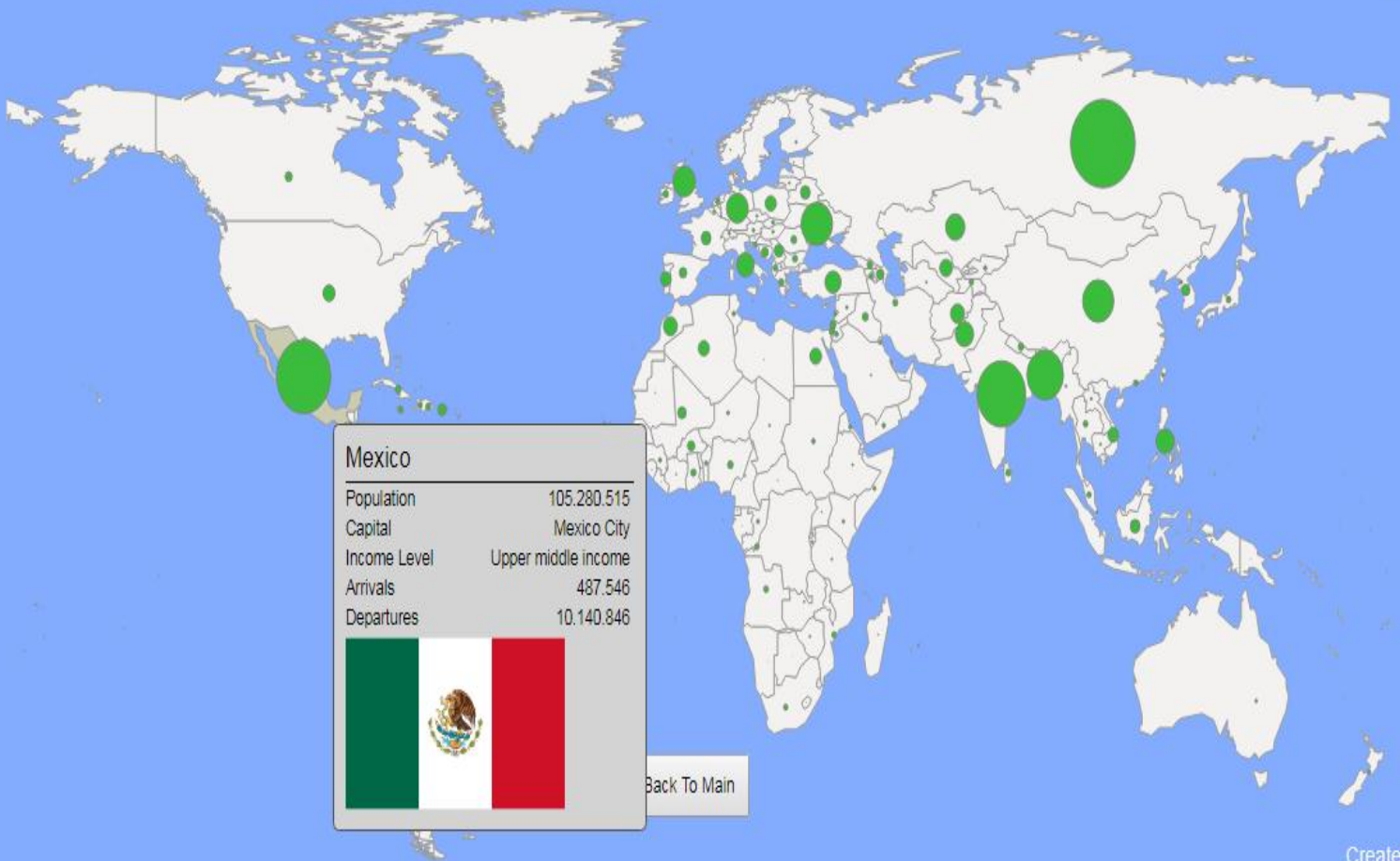
Radius of circles = total arrivals for a country divided by the max total Departures in the world (Russia – 12 millions) then multiplied by a constant(alpha=40)

International Migration Percentage

Arrivals

Departures

People Migration
until 2007



Final Thoughts :

I got a beautiful visualization with many useful tools the user can use, I made a big efforts to make it as simple as possible.

The project gave us a lot of knowledge in in the visualization methods, what is good and what is bad for the human eye, what is more suitable for different kinds of data, how to make large data sets smaller (filtering), it also gave us more experience in javascript.

On the other side, I think a 3d map is better for this kind of visualization, as my 2d map is stretched in north and south,I could also add more features like zoom out, zoom in for the map.

I've tried during the development process to get a feedback form students and friends on how to improve the User Experience as much as possible, but always there is a place for improving.

Thanks !

Majed Abu Mokh ☺