From Central Asia to Europe:
Erasmus Mundus "gSmart" Student Mobility

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Abstract
Student mobility, including obtaining degrees abroad, is one of the most effective means of internationalizing education and establishing a common denominator of qualifications for academics and professionals. The European Erasmus 'family' of programmes stimulates multilateral cooperation projects in higher education, including curriculum development, pedagogical and technical innovation, joint degrees and mobility grants. The 'gSmart' Erasmus Mundus initiative led by the University of Salzburg, Austria brought together six European universities with partners from all five Central Asian countries. Partially building on existing relationships, like the Austria-Central Asia Centre for GIScience in Bishkek serving as a regional hub for communication with Central Asian partner universities, students and faculty from these partner institutions and beyond ('target group 2') were invited to apply for mobility to Europe, with a lower number of grants available in the opposite direction. This study is focused on detailing the characteristics of student mobility flows from Central Asia to Europe, exploring regional characteristics as well as age, gender, academic level and destination preferences.

1. Introduction
Geoinformatics as an academic discipline supported by study programmes was introduced at Central Asian partner universities through the EU TEMPUS "GEM" initiative (Nazarkulova and Strobl, 2012) starting from 2005. Currently the Central Asia region still does not meet the local demand for qualified specialists in geospatial sciences, despite efforts from several capacity building and curriculum development projects carried out over the past decade.

The Erasmus Mundus gSmart project (Brunner-Maresch and Hatheier-Stampfl, 2015) was launched in 2013, aiming at facilitating study periods in Europe on Bachelor, Master, PhD as well as Post-Doc levels, including full graduate qualifications for MSc candidates. All 5 Central Asia countries are involved in this project, through 3 partner universities from Kazakhstan, 5 partner universities in the Kyrgyz Republic, 2 partners in Tajikistan, 1 from Turkmenistan and 2 from Uzbekistan. Students and staff from these partner universities are eligible under target group 1, and all other applicants from partner countries are identified as target group 2. Applicants have an opportunity to apply for study at one of six European partner universities. All information regarding the project is available online at http://em-gsmart.zgis.net.

This study presents statistics and patterns regarding success rates by country and home university, gender of grantees, fluctuations in activity across the sequence of calls for applications (reflecting success in promoting the programme), and resulting mobility flows from Central Asian countries to specific host universities in Europe within the gSmart project. ArcGIS Online based storymapping and data visualization tools are selected due to ease of accessibility to readers anywhere. Storymaps are an easy to use, online mapping and analysis technology not only allowing for great looking maps, but also to share these online including embedding in other websites.

2. Storymaps
Storymaps (Kerski, 2015) are a powerful means to flexibly design, host and present spatially referenced information (http://storymaps.arcgis.com), facilitating the communication of geospatial data to specific as well as general audiences. All maps inserted below are copied from a storymap based on the 'map journal' template designed for gSmart mobilities analysis and reporting, publicly available at http://arcg.is/1sEBB5H. As dynamic online maps (see papers in Muniz-Solari et al, 2015), data are not only presented visually through graphic symbology, but are also fully accessible through popup windows by clicking on or touching symbols. This allows for deep-dive analysis of overall mobility flows and their characteristics.

The storymap approach is not only intended to visualize geospatial data, but also to provide readers

with a full geographical context. 'Spatial Thinking' (National Research Council, 2006) is essential for fully comprehending and subsequently interpreting spatial data in this particular and any other environments. Different audiences were presented with the storymap interface and have expressed high levels of appreciation for this kind of analytics-oriented geovisualisation.

3. Data and Methods

Every scholarship candidate in the gSmart project was directed to apply online and all data were collected in an online database. In this study the application activity and mobility grant successes of the target audience (Central Asians interested in mobility to EU institutions) applying for published calls were explored. Data about each eligible applicant was collected by call-for-applications ('call') in this database and grouped by country. The total number of eligible applicants from Central Asia during the entire project was 609.

The level of interest per call is an indication of the effectiveness of local promotion and flow of information about the gSmart project. The highest response was registered for the second call with total number of 211 applicants, following by 3 calls (3, 4 and 5) with comparable number of applicants. The low number of applications responding to the first call indicates that information was not yet well enough disseminated in the partner countries with

the exception of Kyrgyzstan and Tajikistan. Two specific targeted calls had to be issued for Tajikistan and Turkmenistan due to low responses in previous calls, thus the number of calls for applications differs per country (Figure 1).

These data are visualized on a map (Figure 2) which allows in-depth analysis of applications over the period of the gSmart project. Colours indicate the call with the maximum number of applicants from the respective country. The maximum number of applicants was observed e.g. in the second call for Kazahkstan, Tajikistan and Uzbekistan, with these 3 countries having different intensities of blue colour indicating the degree of predominance of call 2 applications. Figures in circles indicate the total number of applicants per country with e.g. 210 applicants from Tajikistan. CallFinal is the sum of Call5 and the country-specific calls for Tajikistan and Turkmenistan.

4. Applicants and Grantees

Starting from the beginning of the project the number of possible grantees per country, and per target group and per level were identified as in Table 1. Comparing the total number of applicants with the number of scholarships granted per partner country defines the success rate per country, as shown in Table 2 where the maximum success rate is 27.5% for Kazakhstan, and a minimum of 10% for Tajikistan.

Table 1: Target numbers for scholarships per country. Source: http://em-gsmart.zgis.net/scholarships

Third country	Under-graduates	Masters	Doctorates	Post-doctorates	Staff	TOTAL
Kazakhstan	6	9	7	2	2	26
Kyrgyzstan	5	8	4	2	2	21
Tajikistan	4	5	3	2	3	17
Turkmenistan	2	5	3	2	2	14
Uzbekistan	4	5	3	2	4	18
EU				3	5	8

Table 2: Scholarship application success rates per country

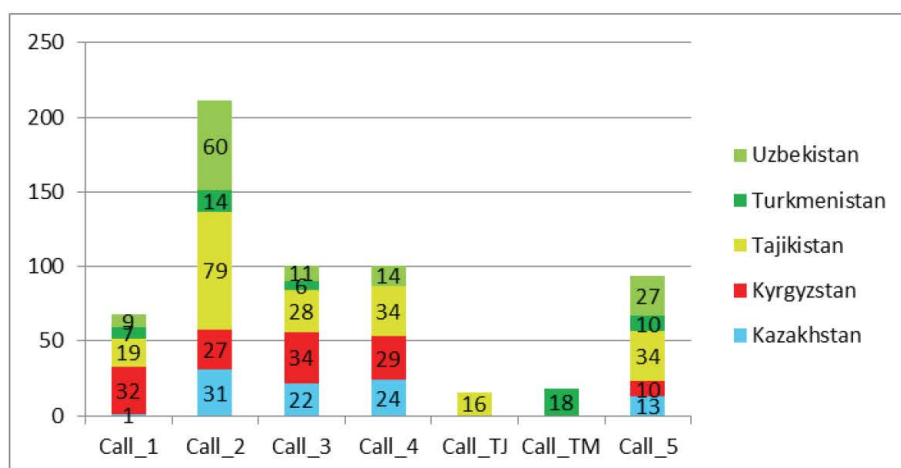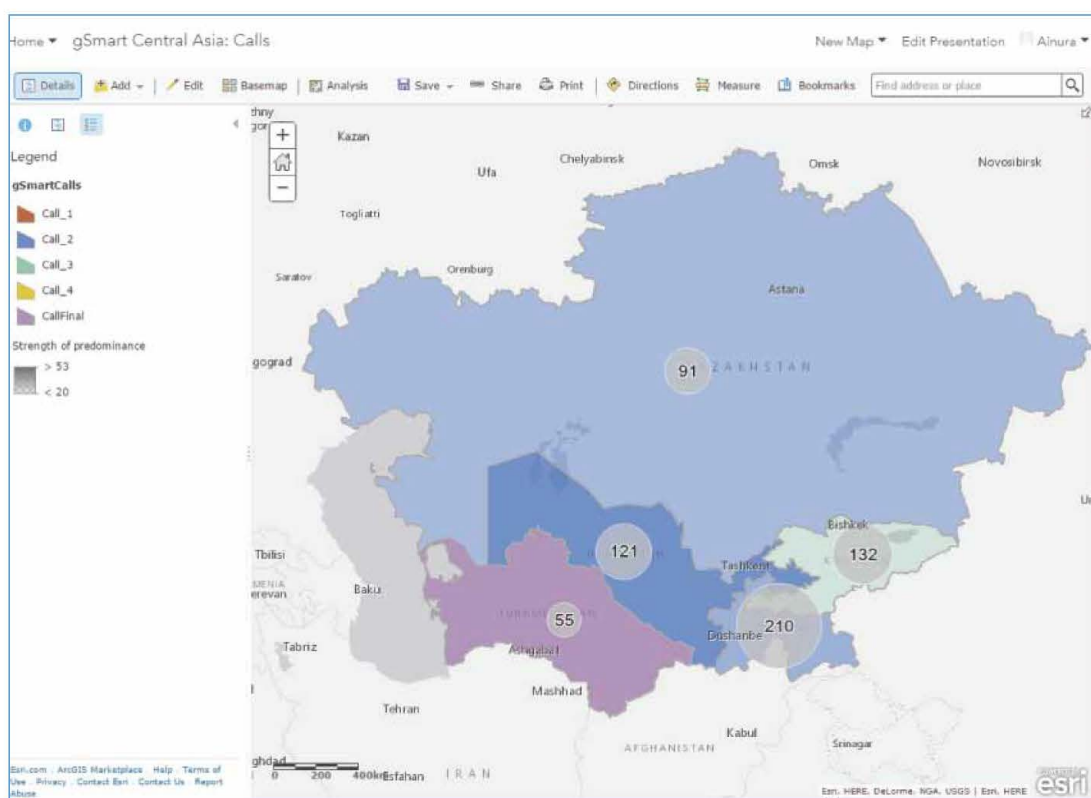| Country	Applicants	Grantees	Female Grantees	Male Grantees	Success Rate (in%)
Kazakhstan	91	25	18	7	27,50
Kyrgyzstan	132	23	12	11	17,40
Tajikistan	210	21	7	14	10,00
Turkmenistan	55	10	1	9	18,20
Uzbekistan	121	19	2	17	15,70
Total CA	609	98	40	58	

Figure 1: Eligible applicants per call

Figure 2: Total number of applications per country, colours indicating the call with the highest response

All information shown on the table can be demonstrated on the map shown as Figure 3. In this map the colour of a proportional symbol indicates the success rate (dark = higher). The size of the symbol represents the number of applicants, and the label (e.g. 23 for Kyrgyzstan) indicates the number of successful applicants receiving a scholarship grant. Further details can be explored by clicking on the interactive map symbols after opening the storymap according to the URL stated above.

5. Gender of Grantees

Issues of gender equality, access to academia and to leadership roles are still very important in Central Asian countries. The academic position of women at university level differs enormously between countries.

Our data set clearly demonstrates a well-established presence of female students in Kazakhstan and in the Kyrgyz Republic. This contrasts with only 1 woman out of total 10 grantees in Turkmenistan, while from 25 scholars/grantees 18 are female in Kazakhstan (Figure 4).

A statistically interesting indication of women's academic activities would be the proportion of female applicants, but such numbers unfortunately were not available to the authors of this study.
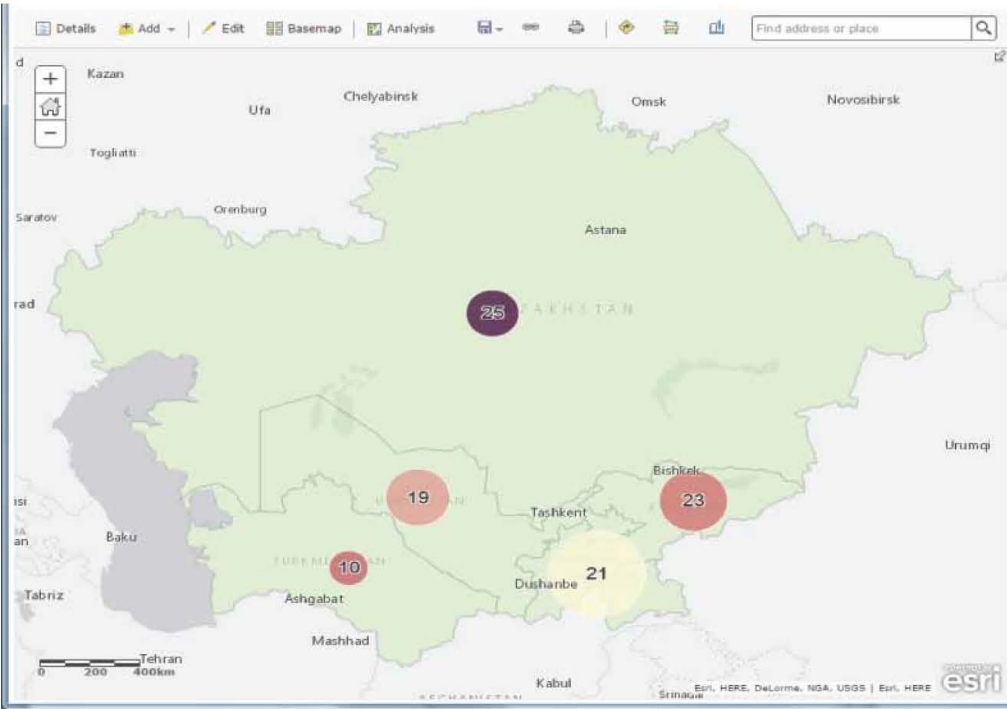

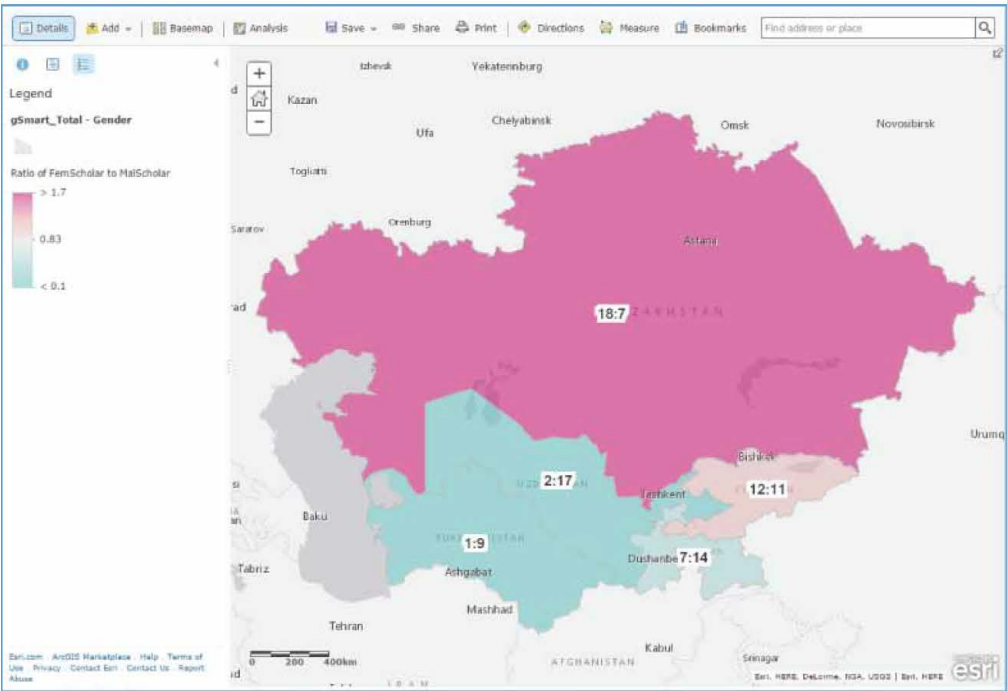Figure 3: Mobility scholarship grantees per country

Figure 4: Gender proportion of successful applicants per country

6. Student Mobility

Scholarship applicants could select a preferred host institution from six EU universities in five different countries: University of Salzburg (PLUS) and Carinthia University of Applied Sciences (CUAS) in Austria, University of West Hungary (UWH), Free University of Amsterdam (VUA), Babeş-Bolyai University in Cluj, Romania (BBU) and University of Malaga, Spain (UMA).

Figure 5 shows the student mobility from Central Asian countries to EU host universities. The maximum number of students (29) have opted for PLUS, University of Salzburg. There are different reasons for this, like background of the candidate, availability of a full Geoinformatics MSc study program in English, administrative issues as obtaining visa and of course individual preferences of applicants.
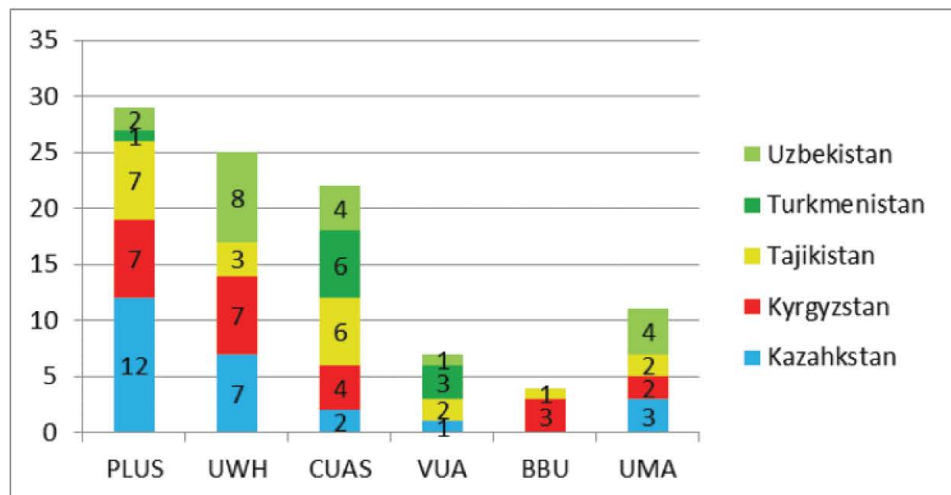
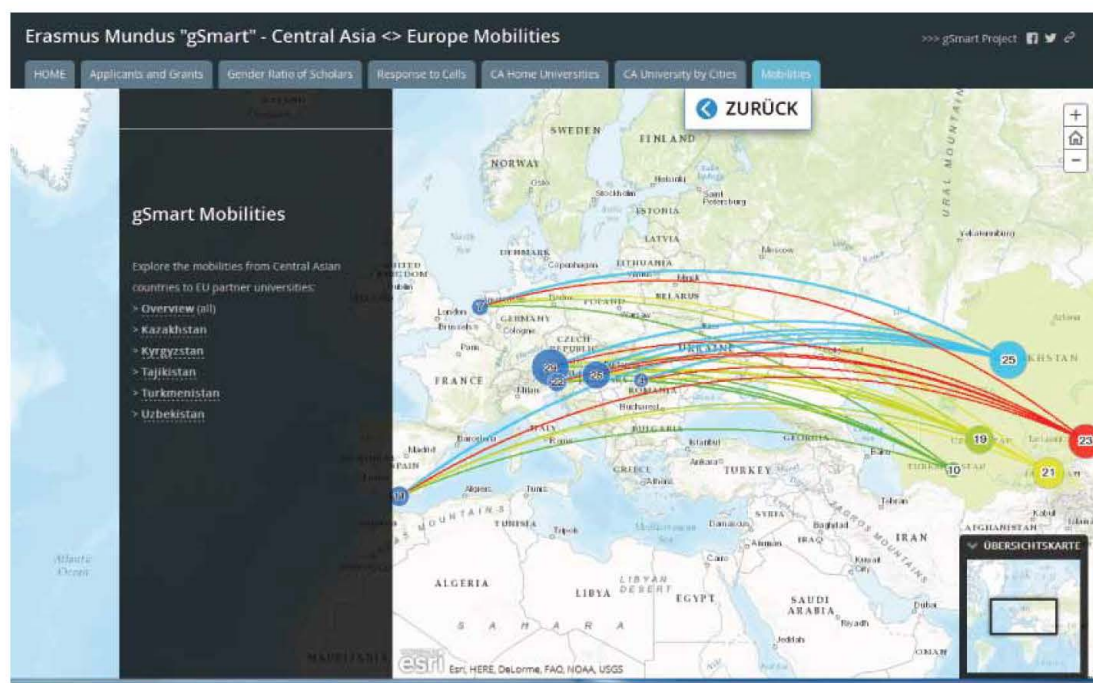Figure 5: Mobility destinations by target university

Figure 6: Mobility patterns from Central Asia to Europe. Source: http://arcg.is/1sEBB5H

7. Summary

In this paper the transformation of statistical data characterizing the outcomes of an academic mobility project into easily understandable and visually-focused interactive and dynamic maps is demonstrated. Effective visualization of relational data like gSmart project mobilities can help an audience to be better informed by providing not only accurate data, but also an interactive, exploratory online environment. The gSmart mobility storymap was created to visualize and to explore project statistics and patterns regarding success rates by country and home university, gender of scholars, activity across the sequence of calls for applications and mobility flows between Central Asian countries and specific host universities. Dynamic online storymap applications are proven to be effective tools to inform an audience, but also to allow deeper analysis by any interested reader

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