



**VGI for SDI Workshop, April 16, 2010**  
**Netherlands Geodetic Commission / Wageningen University**

# **Motives for VGI Participants**

*Zorica Nedović-Budić, UCD*

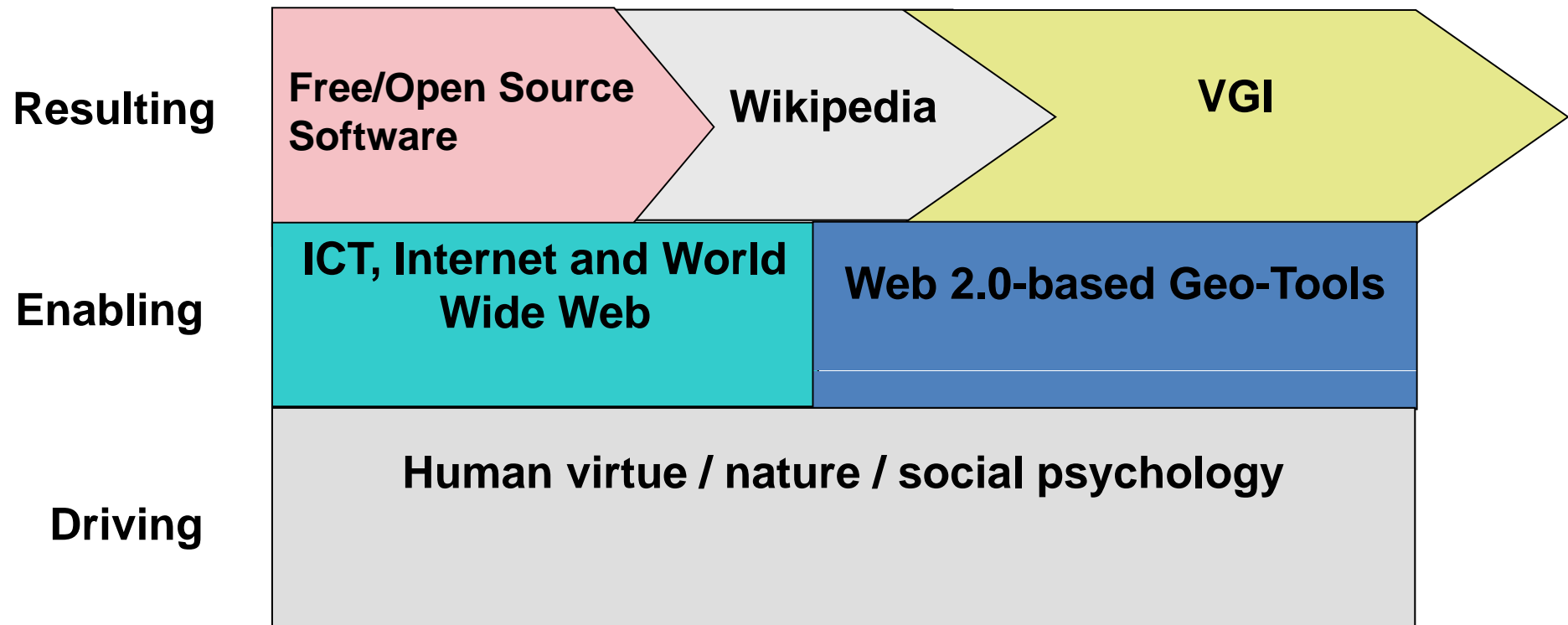
*Nama Raj Budhathoki*

*University of Illinois at Urbana-Champaign*

---



# Contextual View of VGI

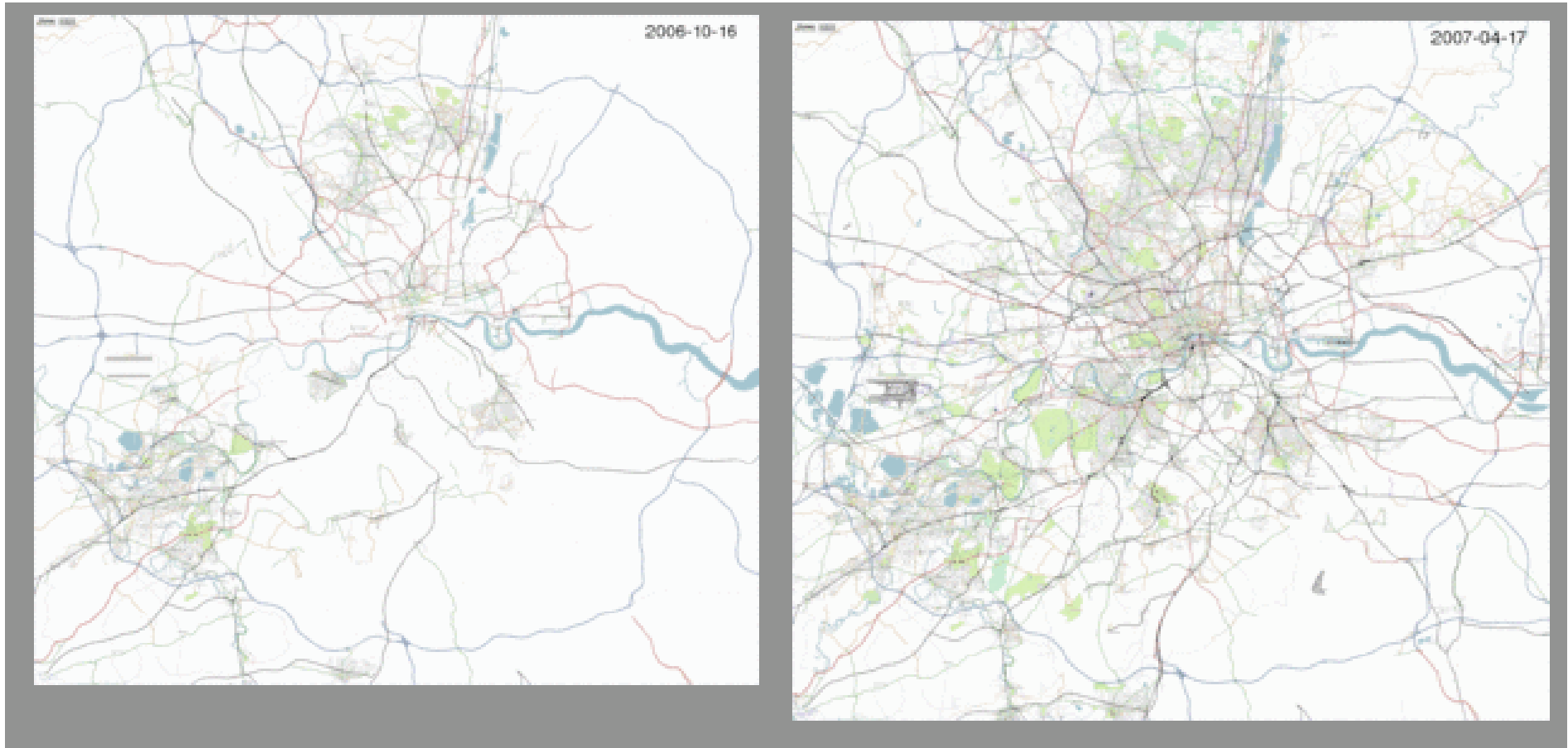




## So, what happens? OpenStreetMap - example



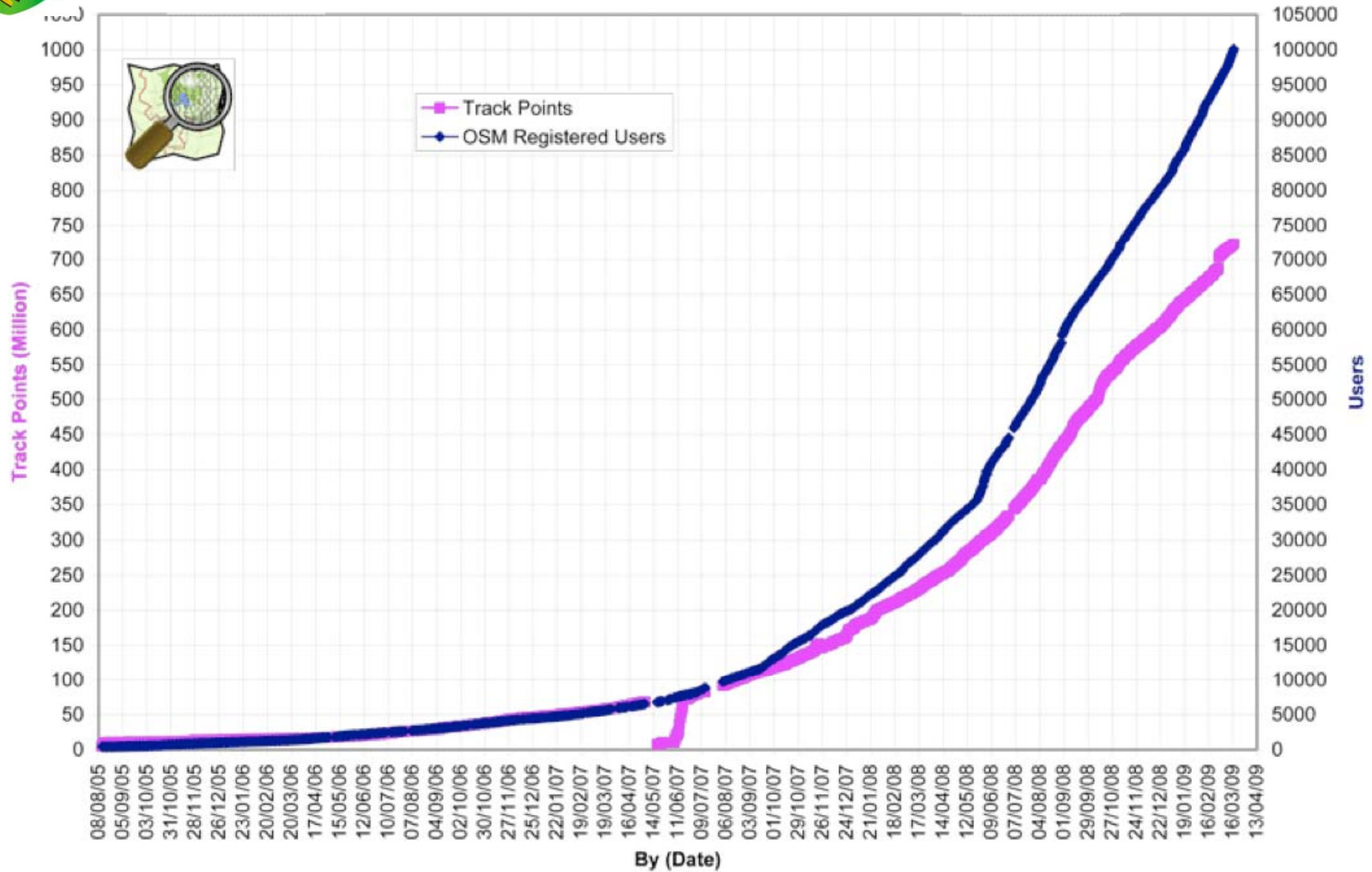
### *London 6 months after*



<http://www.openstreetmap.org>

---

### OpenStreetMap Database Statistics Users and User gpx Uploads (track points)





# Potential / value?



- “The six billion **humans** [**‘sensors’**] constantly moving about the planet collectively possess an incredibly rich store of knowledge about the surface of the Earth and its properties.” (*Goodchild 2007*)
  - “OpenStreetMap information can be **fairly accurate**: On average within about 6 metres of the position recorded by the OS, and with approximately 80% overlap of motorway objects between the two datasets. In the space of four years, OpenStreetMap has **captured** 28% of the area of England.” (*Haklay 2008*)
-



# Contributors' View



- “You'll notice that some folks individually contribute ridiculous, almost incredible and inhumane amounts of work, and they're there every single day of the year.” *OSM Participant X*
  - “I think only about 30% of our user base have ever contributed anything to the map data. Then looking at my own area (which may or may not be typical) I see that 90% of the data is contributed by 10% of the contributors.” *OSM Participant Y*
-



# Ongoing Research Project



- The objectives of the project are to:
  - Scrutinize the **notion of the 'user'** in contemporary GISystem and spatial data infrastructures (SDI);
  - Study the **implications of VGI** to the production and use of geographic information;
  - Propose a **conceptual framework** for studying the phenomenon;
  - Identify users' underlying **motivation** to contribute geographic information;
- **Method:** Literature review, content analysis, and survey.
- Case: **OpenStreetMap** (OSM)
- **Knowledge base:** SDI, PPGIS, Open source software, Wikipedia, sociology of volunteerism, leisure studies, virtual communities, social production of knowledge

The notions of the 'producer' and 'user' of geographic information is changing -- blurred as a result of VGI

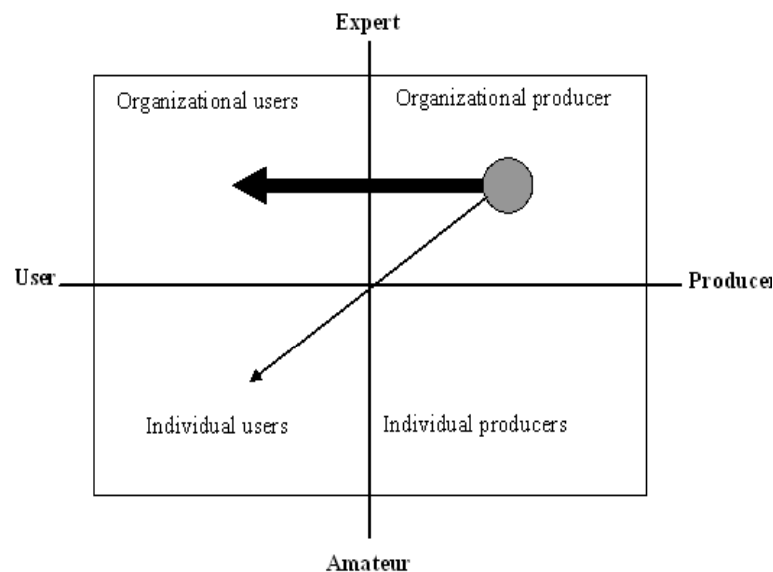


Figure 1: GI production center and conception of the user in contemporary SDIs (Adapted from Eglash 2004)

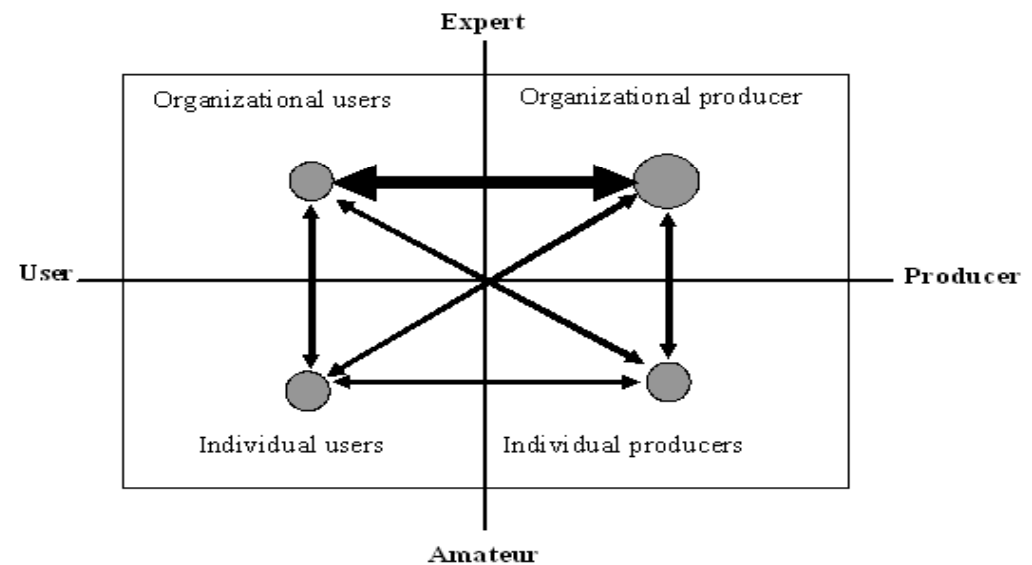
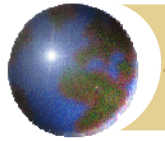


Figure 4: Production-Use dynamic resulting from the VGI phenomenon

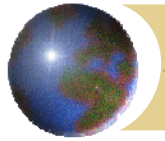




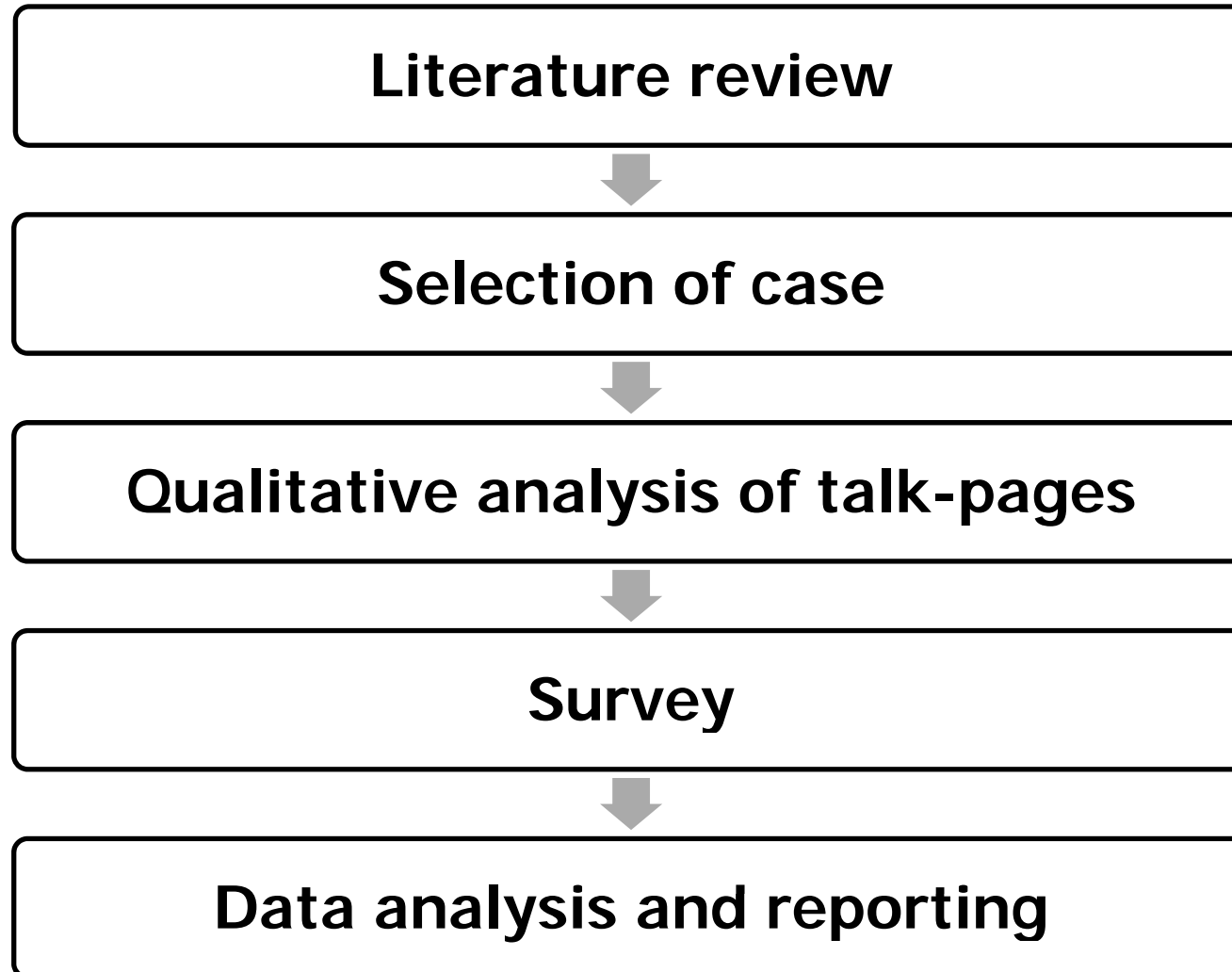
# Propositions to test



- **Altruism (Goodchild 2007, Sui 2008)**
  - **Laypersons, amateurs (Miller 2006, Goodchild 2007)**
  - **Six billion sensors (Goodchild, 2007)**
-



# Research method (mixed)





# VGI Motivational Factors (VGI-MF) (identified from literature)



<i>Motivational Factors</i>	<i>Conceptual Definition</i>	<i>Literature Sources</i>
<b>Unique Ethos</b>	Unique ethos implies the existence of distinguishing ideals, values, sentiments, or guiding beliefs that are shared by the participants of a serious leisure in general and volunteers in particular.	Clary et al. (1998), Nov (2007), Stebbins (1982), Gould et al. (2008), Nov (2007)
<b>Learning</b>	The volunteer is seeking to exercise skills that are often unused and learn more.	Clary et al. (1998), Lekhani and Hippel (2003), Hippel and Krogh (2003), Nov (2007)
<b>Career</b>	An individual uses the voluntary work as a platform to signal his or her skills for career opportunity.	Clary et al. (1998), Lerner and Tirole (2002), Hertel et al. (2003), Shah (2006), Nov (2007)

<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Personal enrichment</b>	It is a process of increasing one's intellectual or spiritual resources, which is found in the accumulation of cherished and valued experiences resulting from serious participation.	Stebbins (1982), Gould et al (2008), Clary et al. (1998), Nov (2007)
<b>Self-actualization</b>	It comprises the development and application of one's talents, capacities, and potential.	Stebbins (1982), Gould et al. (2008)
<b>Self-expression</b>	It consists of the expression of one's abilities and individuality.	Stebbins (1982), Gould et al. (2008)

<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Self-image</b>	It is enhanced through the expression of unique skills, abilities and knowledge.	Stebbins (1982), Gould et al. (2008)
<b>Self-gratification/Fun</b>	Self-gratification or the satisfaction of one's own desires, pertains to depths of satisfaction that may be at once fun, but also profound and fulfilling. An individual volunteers for hedonic gain.	Wasko and Faraj (2005), Lee et al. (2008), Hertel et al. (2003), Shah (2006), Hippel and Krogh (2003), Nov (2007), Stebbins (1982), Gould et al. (2008)
<b>Re-creation</b>	It is the process of forming anew or creating one's self again; that is, the serious leisure participant retains a sense of renewal, regeneration or reinvigoration through participation in serious leisure.	Stebbins (1982), Gould et al. (2008)

<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Social</b>	An individual volunteers to strengthen his or her social relation; participation in volunteerism depends on the reaction of his or her significant others.	Clary et al. (1998), Hertel et al. (2003), Nov (2007), Klandermans (1997)
<b>Group accomplishment</b>	These outcomes are derived from group efforts in completing a project or goal and provide for the participant a sense of helping, being needed and being altruistic. An individual carefully analyzes the goal of the project and its likelihood of attainment to participate in volunteerism.	Klandermans (1997), Hertel (2002), Hertel et al. (2004), Bryant et al. (2005), Stebbins (1982), Gould et al. (2008)
<b>Group attraction</b>	These outcomes are derived from associating with other serious leisure participants.	Stebbins (1982), Gould et al. (2008)

<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Group maintenance</b>	This pertains to efforts on behalf of the serious leisure participant to ensure that the serious leisure group is maintained, continues to develop, and remains a cohesive unit.	Stebbins (1982), Gould et al. (2008)
<b>Identity</b>	By joining a group, an individual behaves according to the norms of the group and develops his or her identity. The participant is inclined to strongly identify him/herself with the chosen pursuit.	Houle et al. (2005), Simon et al. (1998), Hertel et al. (2003), Stebbins (1982), Gould et al. (2008)
<b>Reputation</b>	An individual volunteers to enhance his or her reputation.	Wasko and Faraj (2005), Kuznetsov (2006)

<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Monetary</b>	An individual participates in serious leisure seeking a direct monetary benefit.	Stebbins (1982); Gould et al. (2008)
<b>Instrumentality</b>	An individual volunteers if s/he believes that his or her contribution is crucial to accomplish the goal of the project.	Houle et al. (2005), Hertel (2002), Hertel et al. (2004)
<b>Cognitive capital/self-efficacy</b>	A volunteer contributes if s/he perceives him/herself as having the knowledge and skills to meet the expectation of others in the team.	Wasko and Faraj (2005), Hertel (2002), Hertel et al. (2004), Bryant et al. (2005)
<b>Reciprocity</b>	An individual volunteers if s/he believes that others will reciprocate and will not exploit his or her contribution.	Hertel (2002), Hertel et al. (2004), Shah (2006), Kuznetsov (2006)



<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Sense of community</b>	An individual volunteers to develop a sense of community.	Hertel et al. (2003), Kuznetsov (2006)
<b>Meeting own need</b>	When existing product/service does not meet his or her own needs, an individual joins voluntary community to collectively develop the product/service.	Hertel et al. (2003), Shah (2006), Raymond (1999), Hippel (2007)
<b>Freedom and creativity</b>	An individual participates in voluntary activities as s/he has a freedom to choose tasks and exercise his or her creativity.	Shah (2006), Kuznetsov (2006)
<b>Altruism</b>	Volunteered action is directed by altruistic reasons.	Lee et al. (2008), Kuznetsov (2006)

<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Trust in the underlying infrastructure</b>	The volunteer's contribution depends on his or her belief about the reliability of the underlying technical infrastructure.	Hertel (2002), Hertel et al. (2004)
<b>Protective</b>	An individual uses volunteering to reduce negative feelings such as guilt or to address personal problems.	Clary et al. (1998), Nov (2007)
<b>Structural capital</b>	An individual's contribution in voluntary works depends on how densely embedded s/he is in the network.	Wasko and Faraj (2005)
<b>Self-presentation</b>	One can present his or her in the desired light through volunteering.	Lee et al. (2008)

<i>Motivational Factors</i>	<i>Conceptual definition</i>	<i>Literature sources</i>
<b>Relation management</b>	Volunteering allows an individual for a better management of relationship with others.	Lee et al. (2008)
<b>Socio-political motives</b>	An individual participates in volunteerism to meet his or her socio-political motives.	Hertel et al. (2003)

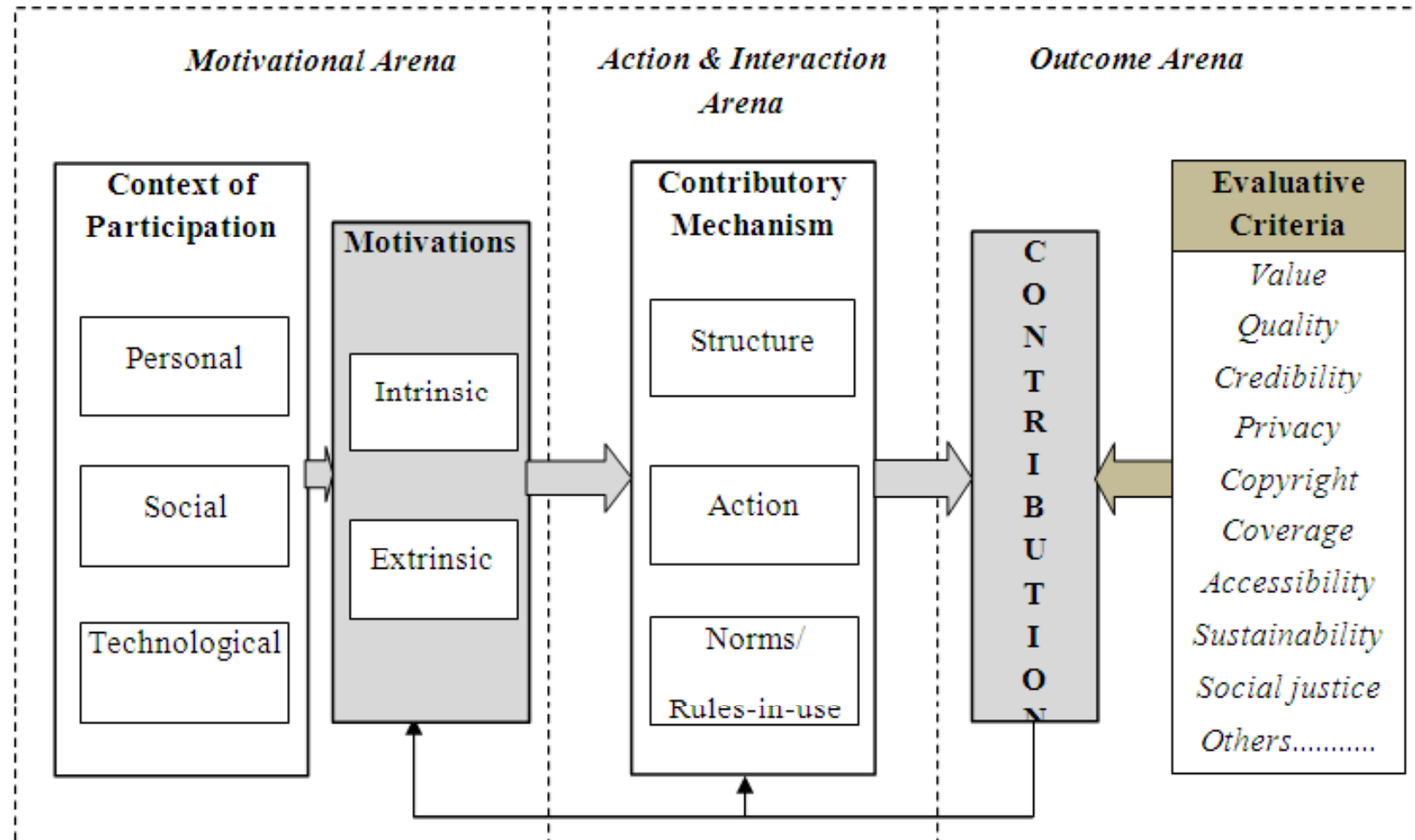
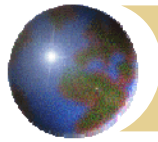
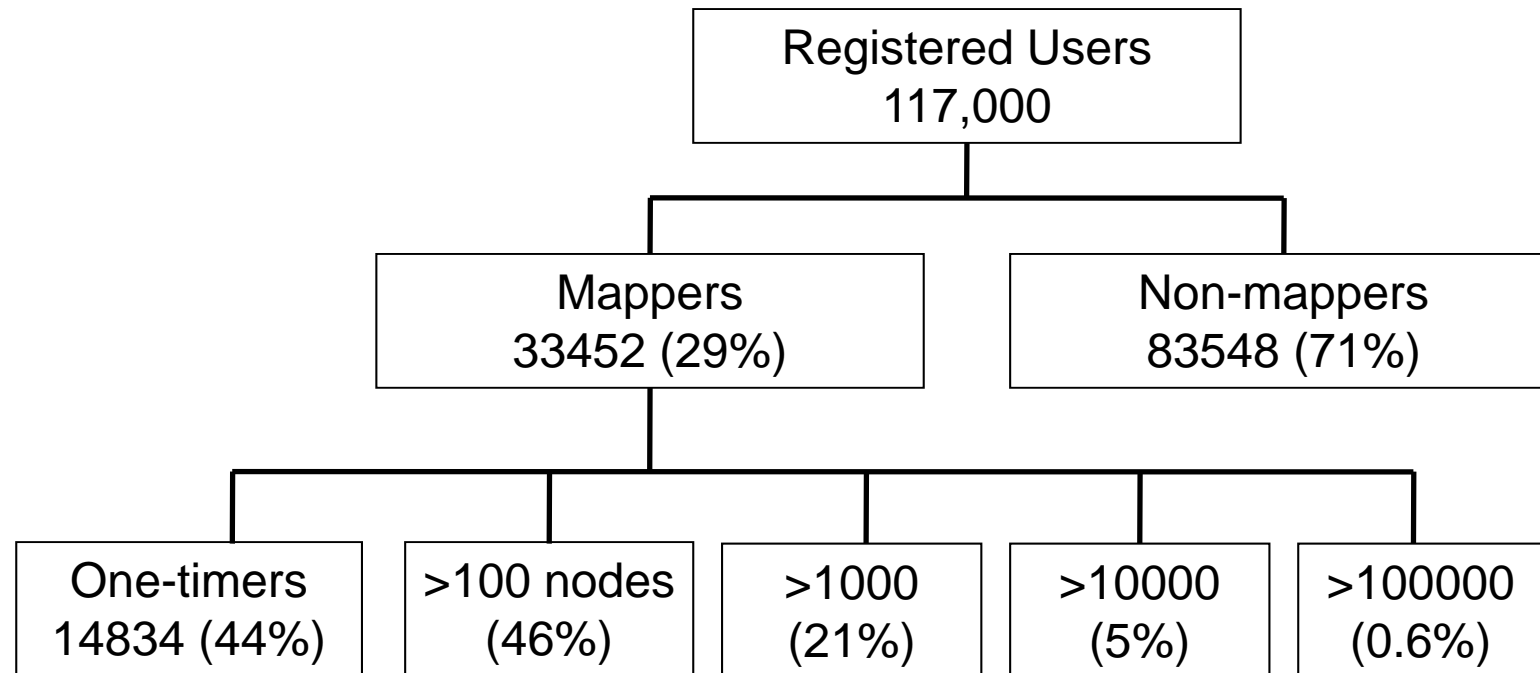


Figure 1: A conceptual framework for VGI



# OSM contributors' profile



Source: [www.openstreetmap.org](http://www.openstreetmap.org)  
<http://downloads.cloudmade.com/> (Accessed on April, 2009)

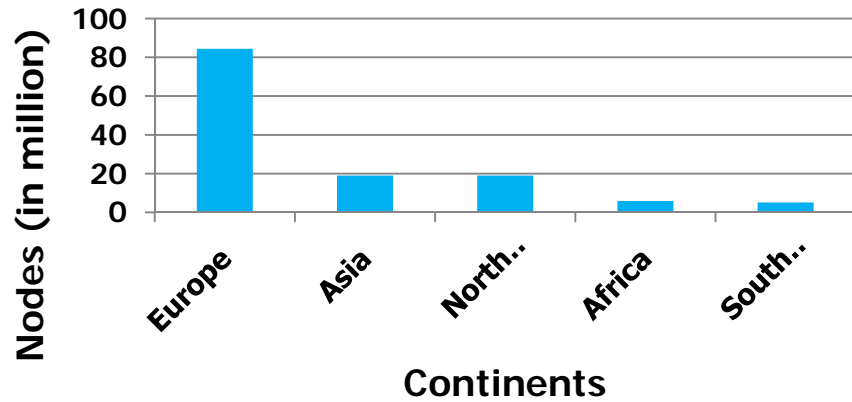
---



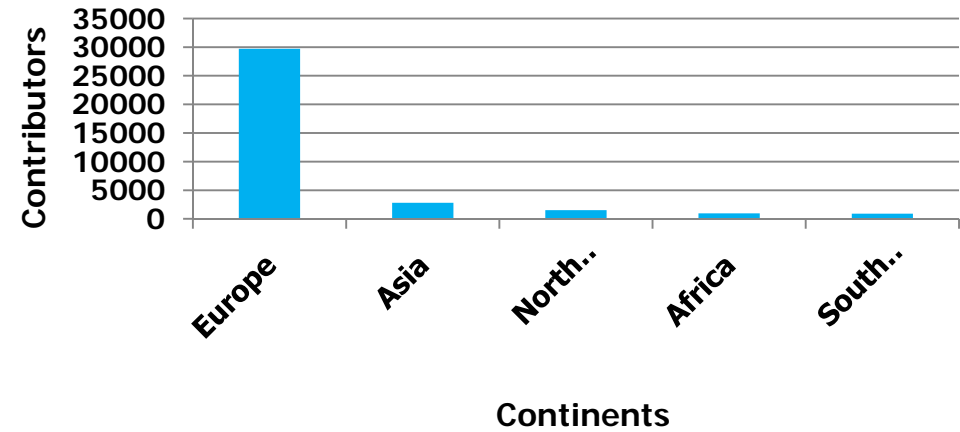
# OSM: geography of contribution



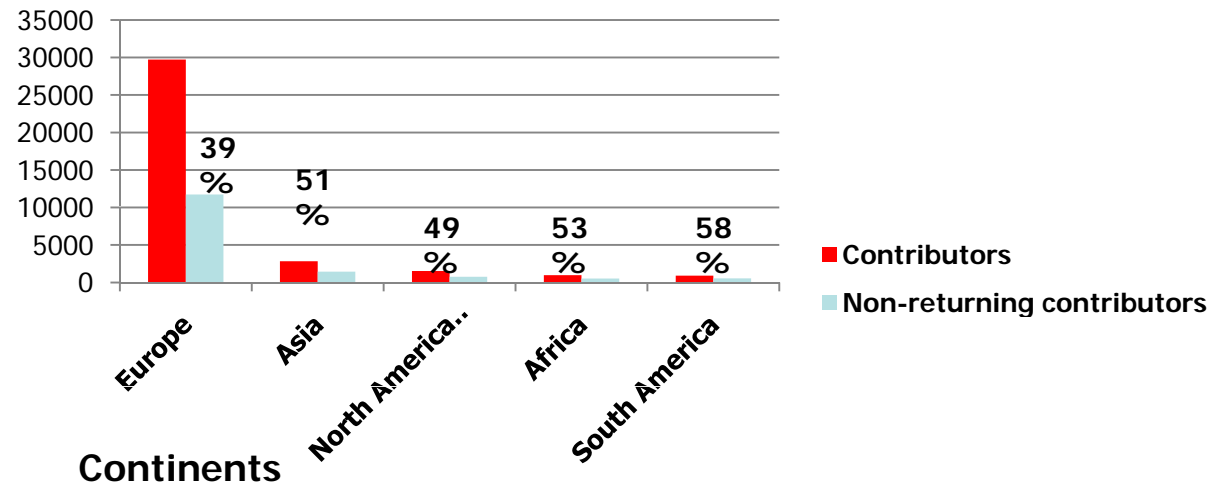
### Distribution of nodes By continent



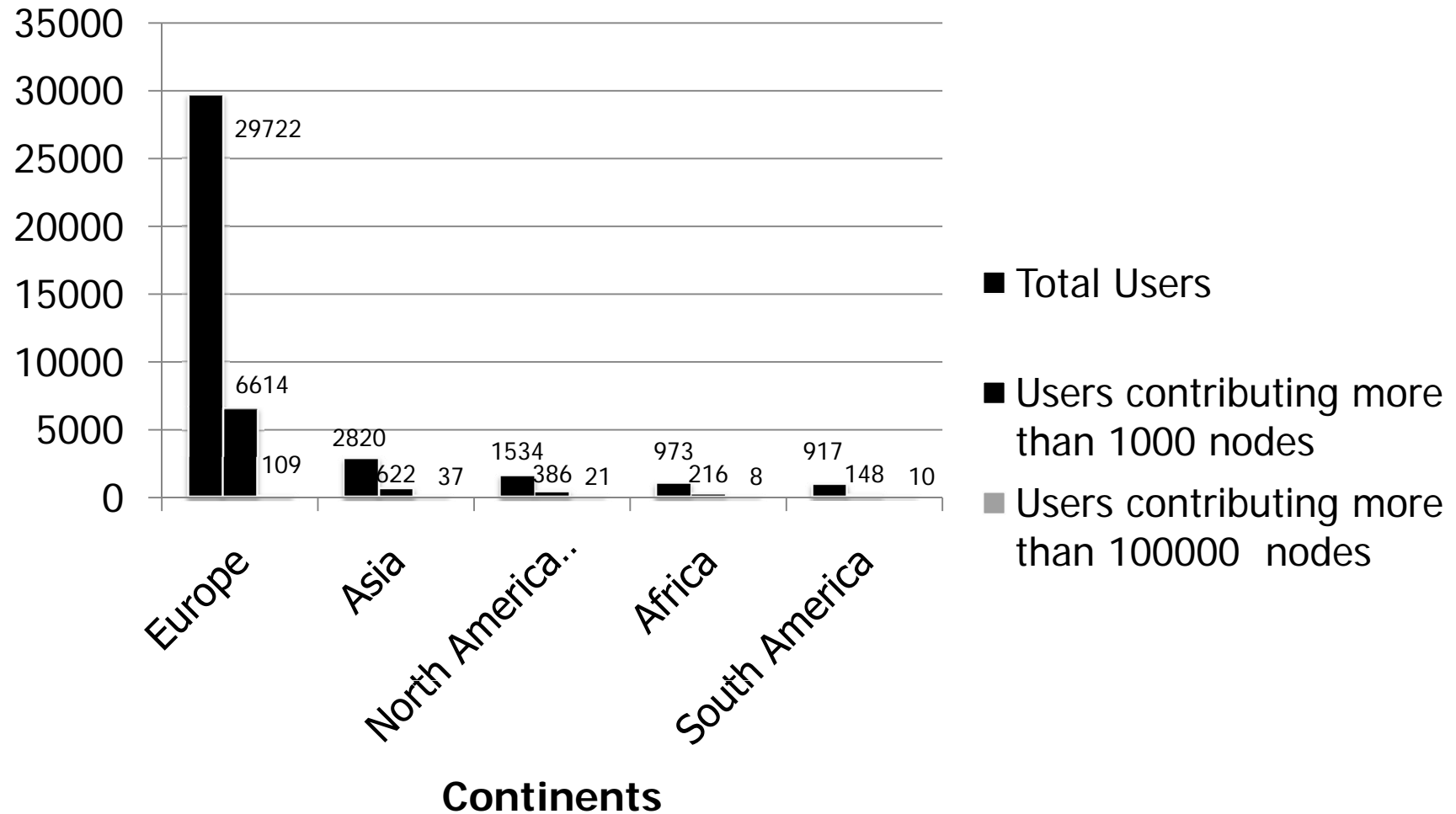
### Distribution of contributors By continent

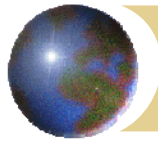


### Non-returning contributors By continent

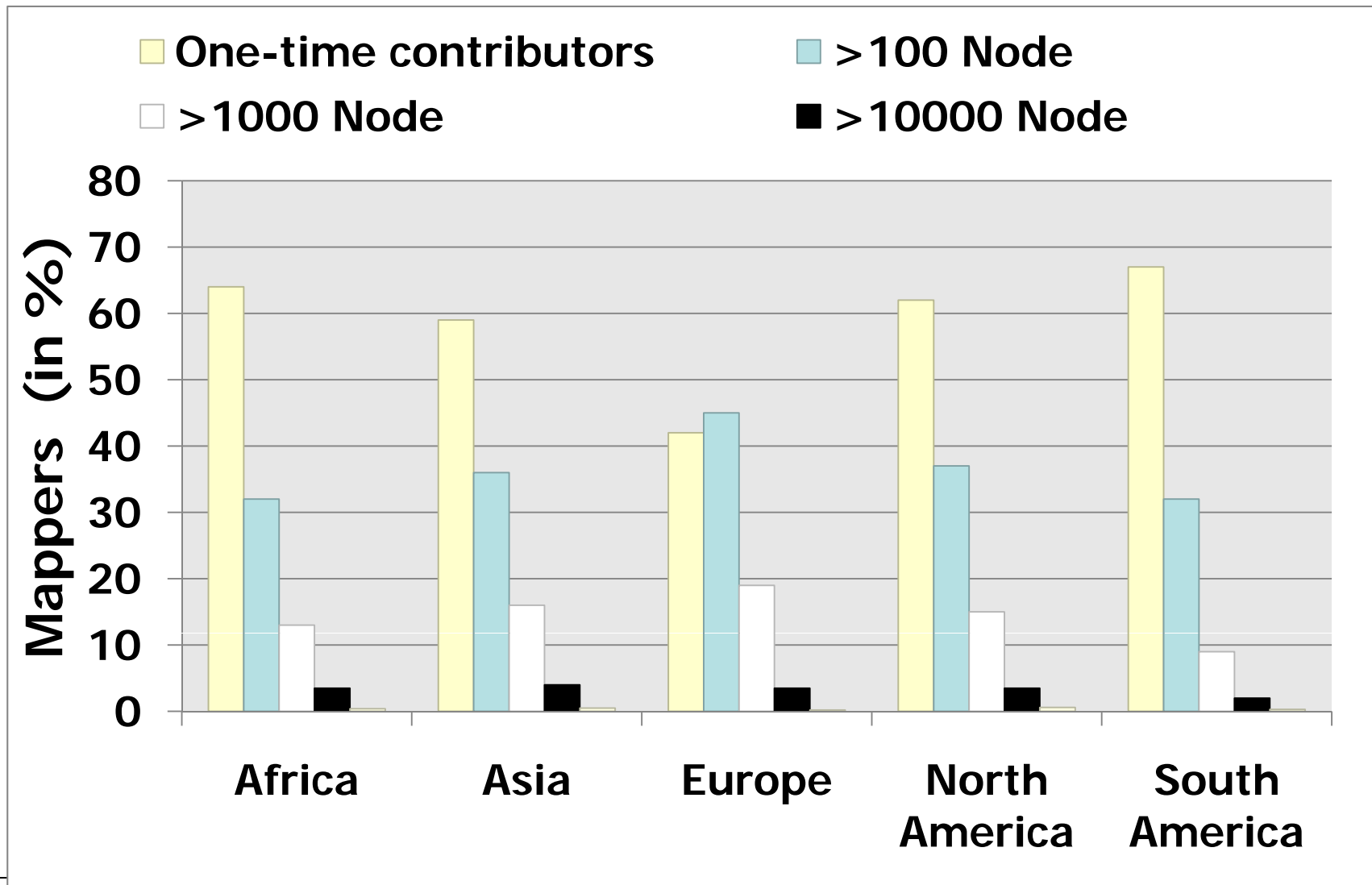


## Levels of Contribution





# OSM mappers by level and geography





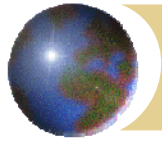


# Findings: motives (content analysis)



**Motivations identified through qualitative analysis of the OSM 'talk pages':**

- **Fulfillment of self-need**
  - **Anti-corporate sentiment (unique ethos)**
  - **Expectation of reciprocity**
  - **Visual power of map (self-gratification)**
  - **Outdoor activity (re-creation)**
  - **Pride of local knowledge**
  - **Concerns for a substantive issue (need)**
  - **Other – explored: monetary, hobby, learning**
-



# Testimonials

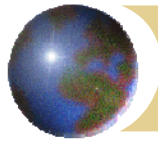


...**commercial mapping products are constantly failing** us up here in rural Quebec. On a number of occasions my husband and I have both wished that we could just upload our own GPS data **to fix the existing maps.**

It's all **frustratingly out of date--**showing non-existent logging roads as real streets, and not showing major interurban routes. I suspect that in many rural parts of Canada neither government nor industry has any motivation to verify old data.

**Mapper A**

---



# Testimonials



Being an author of books which are using maps, I am **not able to pay royalty fees** to map companies like google or teleatlas.

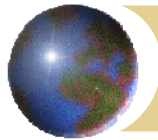
**Mapper B**

It's a lot of **fun**, and it's nice to see your work **appear** 1-2 hours after it's done available to the whole world :)

**Mapper C**

...I love to see the area around where I live **accurately mapped (and updated in a timely manner)**. I get enormous **satisfaction** out of this entire process as well as know that I'm contributing towards a valuable **resource that others can use**. I also enjoying exploring on my bike new areas that I'm mapping - I've **discovered some cool suburban places** that I never new existed - often within meters of roads that I drive down regularly.

**Mapper D**

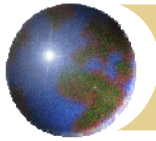


# Survey: respondents



## DISTRIBUTION OF SURVEY RESPONDENTS

<i>Contributed to</i>	<i>Total contributors</i>	<i>Survey respondents</i>
Africa	442 (1.4%)	29 (6.5%)
Asia	1798 (5.8%)	16 (3.6%)
North America	3284 (10.6%)	41 (9.2%)
South America	665 (2.1%)	0 (%)
Europe	23111 (74.5%)	316 (71.2%)
More than one continent	1715 (5.5%)	42 (9.4)
<b>Total</b>	<b>31015</b>	<b>444</b>



# PRELIMINARY findings: contributions - nodes, frequency & longevity

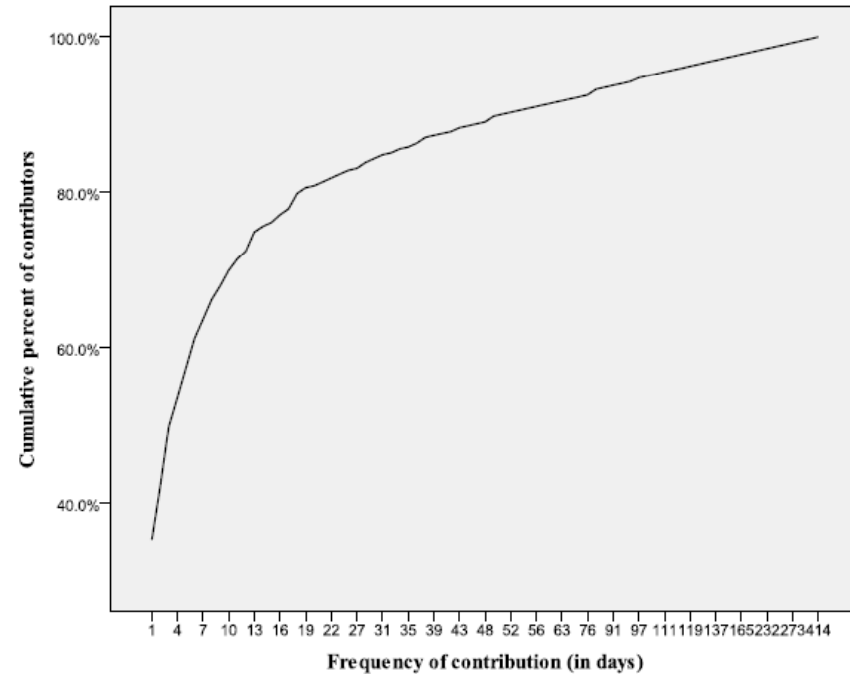
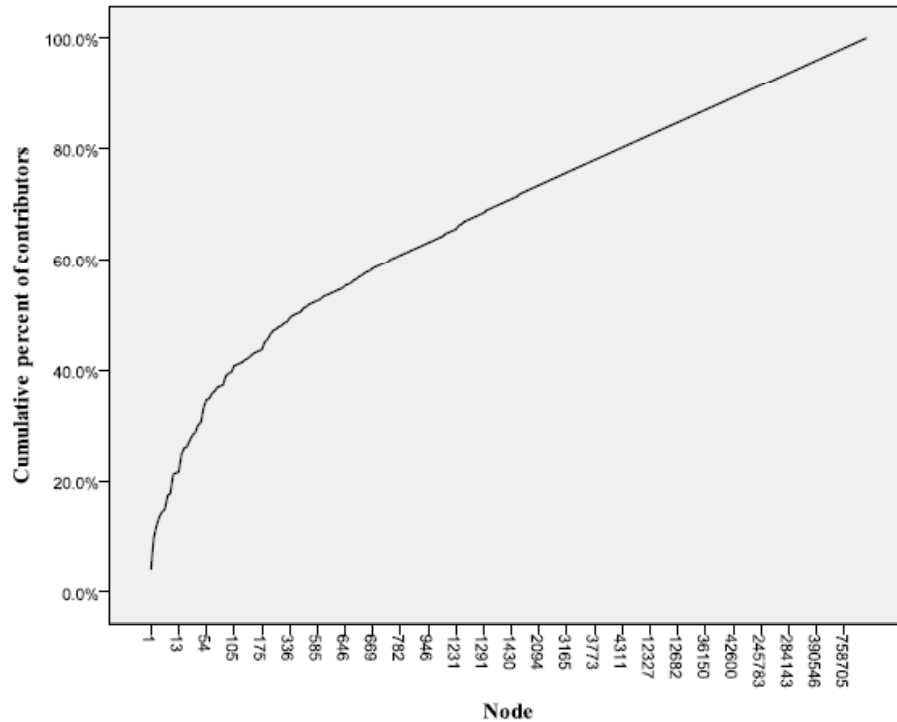
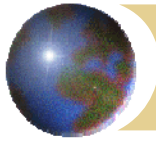


Figure 4: Frequency of contributions by the survey respondent

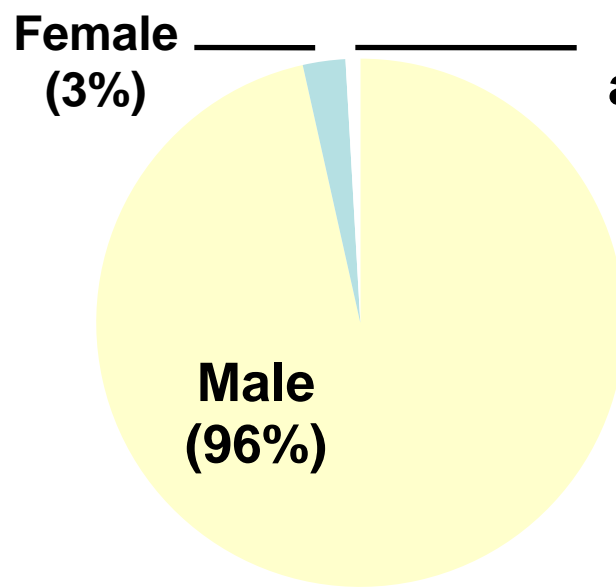
	Nodes	Hours	Longevity	Frequency
Nodes	1			
Hours	0.029	1		
Longevity	0.106*	0.442**	1	
Frequency	0.443**	0.511**	0.678**	1

\*=p<0.05; \*\*=p<0.01

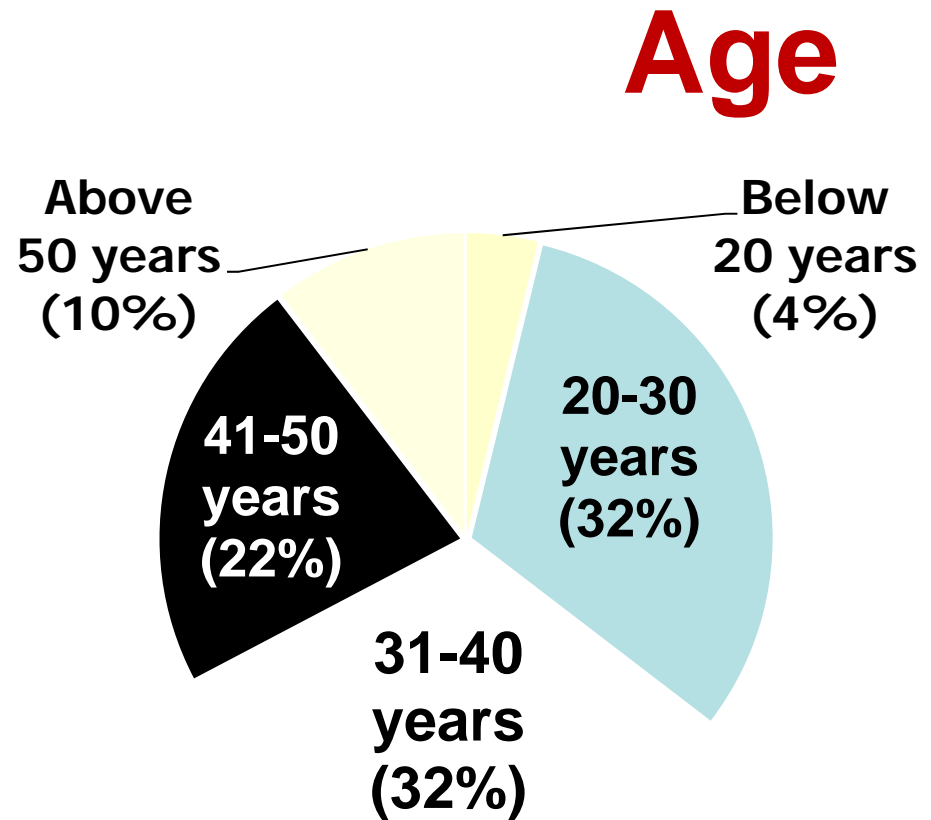
**Correlation coefficient between 4 dimensions of engagement**



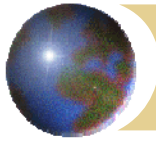
# Contributors' characteristics (N=426)



## Gender



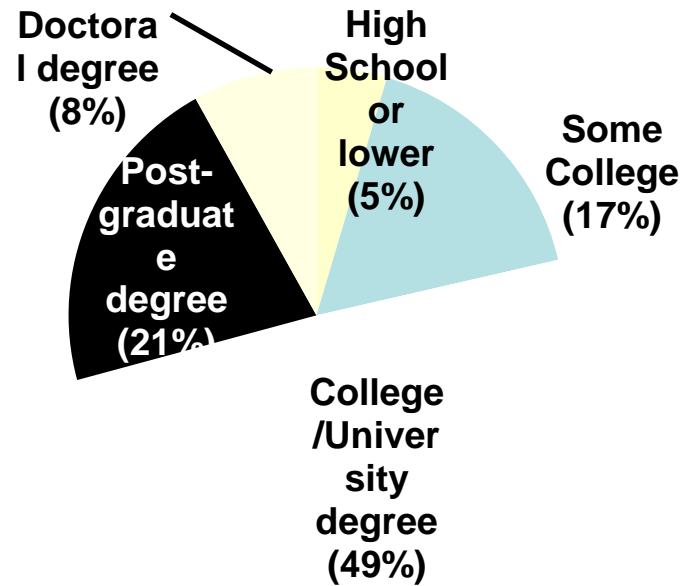
## Age



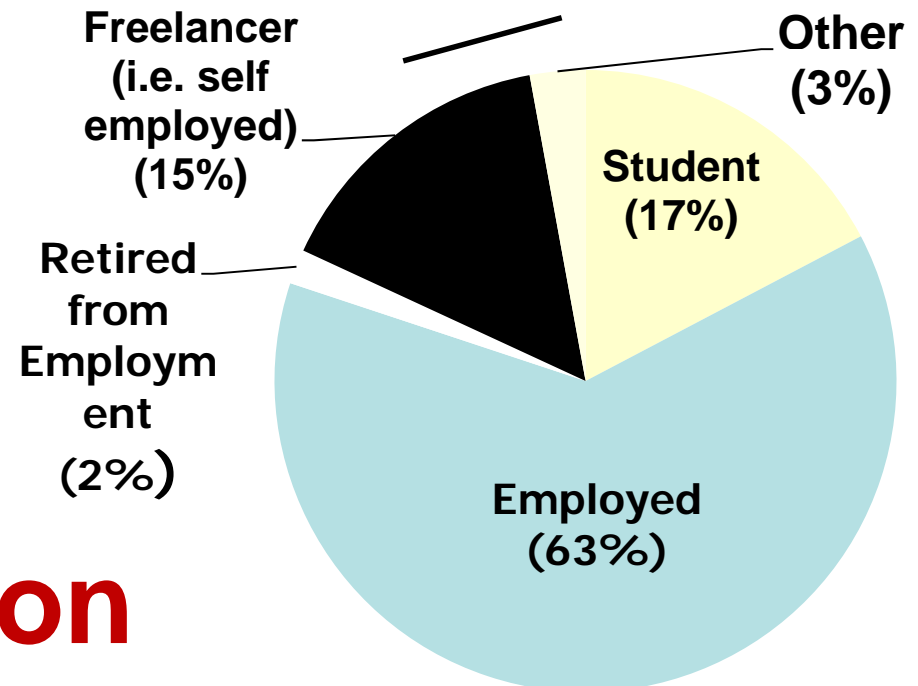
# Contributors' characteristics (N=426)

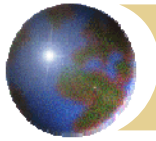


## Education

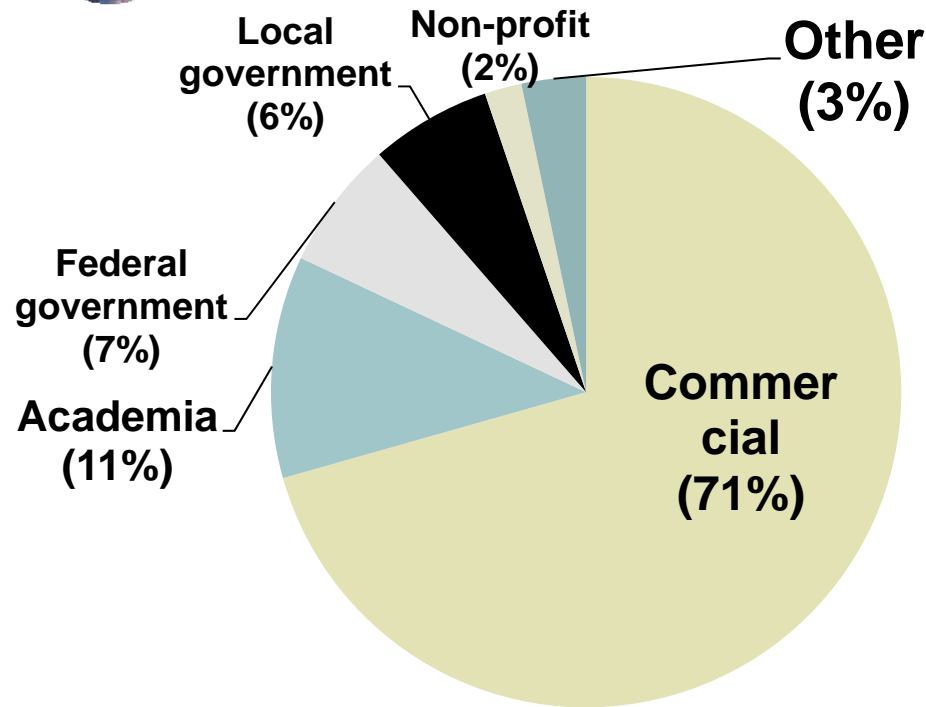


## Occupation



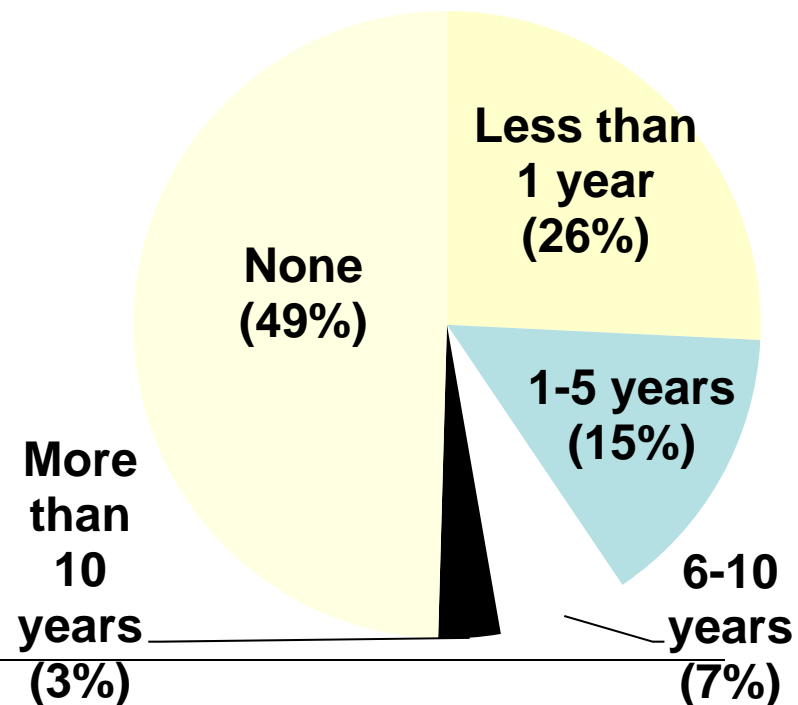


# Contributors' characteristics (N=426)

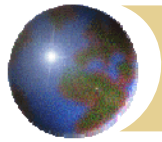


## Employment

## GIS experience





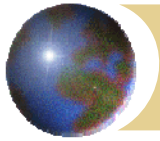


# Place used for contribution

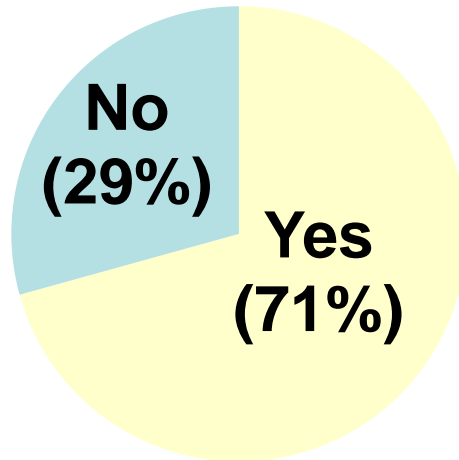


<b>Place</b>	<b>In percent (%)</b>
<b>Home</b>	<b>96</b>
<b>Office</b>	<b>18</b>
<b>Mobile</b>	<b>13</b>
<b>Public libraries</b>	<b>0</b>
<b>Internet cafes</b>	<b>0.3</b>
<b>Others</b>	<b>0.6</b>

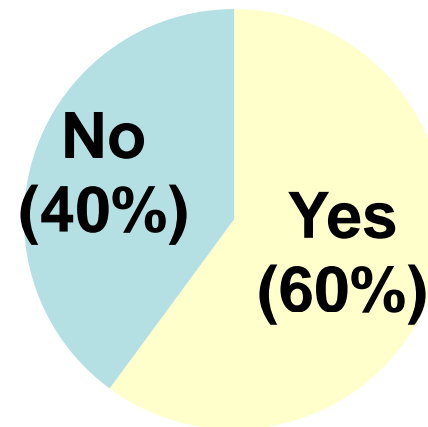
---

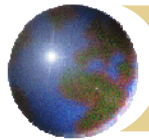


**Have you ever contributed to any other free content systems such as Wikipedia?**



**Have you ever contributed to any other open source software project?**



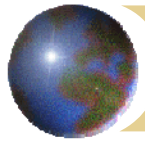


# Motives in the order of perceived\* importance



<i>MOTIVATION</i>	<i>Mean</i>	<i>SD</i>
Value on the free availability of digital geographic information	6.45	0.897
<i>Project goal</i>	<i>6.14</i>	<i>.77</i>
Fascination to map	6.05	1.042
Enjoyment	6.00	0.938
Perceived achievability of the project goal	5.97	0.93
Belief on the goal of the project	5.95	1.053
Creation of accurate map	5.94	0.919
<i>Altruism</i>	<i>5.73</i>	<i>.83</i>
<i>Instrumentality of local knowledge</i>	<i>5.58</i>	<i>.81</i>
Representation of place	5.41	1.088
<i>Learning</i>	<i>5.29</i>	<i>.95</i>
Expectancy that other members of the community will contribute	5.24	1.324
<i>Self need</i>	<i>5.2</i>	<i>1.19</i>
Self efficacy	5.09	1.305
Develop mapping skill	4.97	1.218
Unavailability of the map data one is seeking	4.88	1.695
Explore world geography	4.80	1.272
Develop technical skills	4.58	1.304
<i>Social/Show off</i>	<i>4.04</i>	<i>1.00</i>
Enhance resume	3.86	1.327
Show to friends and family	3.71	1.263
Display skills to potential employers	2.48	1.362
Future business plan	2.28	1.442
<i>Monetary</i>	<i>2.14</i>	<i>1.06</i>
Financial benefit	1.78	1.205

\*perceptions measured on 1-7 Likert scale; factors in italics are indices

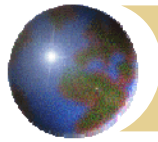


# Motivational difference between serious & casual mappers (only 7 indices included)



<i>Motivational construct</i>	<i>Serious mapper (n=63)</i>		<i>Casual mapper (n=343)</i>		<i>Significance of difference</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
<b>Project goal</b>	6.1	0.7	6.2	0.8	P=0.442
<b>Altruism</b>	5.6	0.8	5.8	0.8	P=0.258
<b>Instrumentality of local knowledge</b>	6.0	0.7	5.5	0.8	p<0.001**
<b>Learning</b>	5.5	0.9	5.2	1.0	P=0.015**
<b>Self need</b>	5.2	1.3	5.2	1.2	P=0.996
<b>Social/Show off</b>	4.2	0.8	4.0	1.0	P=0.099*
<b>Monetary</b>	2.7	1.1	2.0	1.0	p<0.001**

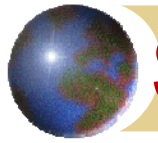
\*= $p < 0.1$ ; \*\*= $p < 0.05$



# Summary of preliminary findings



- Uneven contribution by geographic world regions
  - The contributors tend to be educated males (professionals, technologically and cyber-savvy, many experienced with GIS) – contrary to the thesis about the mass of ‘human sensors’
  - Majority is from the commercial sector or academia, employed, but contributing from home -- which could be considered as leisure
  - Relationship between output variables – number of nodes contributed, number of hours spent, frequency and longevity of contribution is not clear; but in general – the activity of an average contributor is not very high
-



# Summary (continued)



- The strongest motives tend to be non-monetary, driven by mapping goals and values; altruism; personal place-based needs; local knowledge; community building and expectations; learning, development and self-expression; employment prospects and business plans.
  - Serious mappers are more driven by knowledge, show off and financial motives; but they cannot be differentiated from the causal mappers based on their goals, altruism and need.
-



# Conclusion



- Literature suggests that a variety of factors drive people to contribute online geographic information
  - From about 30 identified , many relevant to VGI – mostly non-monetary
  - Analysis is still not completed ; next: regressions modeling
  - Implications for policy / practice: If garnering / integrating the contributions is the goal -- understanding the motivation and creating socio-technical processes / systems that address them would help achieve the goal; this research is a first step
  - Different approach may be needed to capture more representative local knowledge and input
  - Implications for theory: testing general concepts on volunteering, online communities and social production of knowledge
  - Further research themes:
    - SDI &VGI – compatibilities, differences, purposes
    - Potential within local and regional planning process (awareness, communication, decision support, etc.); potential for local empowerment
-