

International Master in Geodesy

“Geodesists measure the world”

Geodesy is concerned with the development and application of advanced technology, often satellite-based, to observe the planet and provide geospatial information underpinning the most urgent challenges of today.



Initiating team



the Netherlands

Switzerland

Italy

Sweden

Initiating team

- Ramon Hanssen, Peter Teunissen, Roderik Lindenbergh, Joris Timmermans, Dept. of Civil Engineering and Geosciences, *TU Delft*
- Andreas Wieser, Konrad Schindler, Dept. of Civil, Environmental and Geomatic Engineering, *ETH Zürich*
- Riccardo Barzaghi, Dept. of Civil and Environmental Engineering, *Politecnico di Milano*
- Rüdiger Haas, Jan Johansson, Onsala Space Observatory, *Chalmers University of Technology*

Our proposition:

1. Establish a joint international European MSc program in Geodesy
2. Combine resources of universities, scientists, and educators in Europe
3. Respond to the urgent need for academic geodesists
4. Inspirational collaboration via complementary fields

The IDEA League is a strategic alliance between five leading European universities of technology: TU Delft, ETH Zurich, RWTH Aachen, Chalmers University and Politecnico di Milano.

Each IDEA League member has a respectable research-oriented profile and is the largest producer of engineering and science graduates in its own country. One of the IDEA League's main ambitions is to re-establish Europe as a technological and

scientific leader by bundling academic resources and knowledge.

Our joint activities in education, research and quality assurance, as well as our joint participation in EU programmes and initiatives make us a model of European cooperation. Together, we create added value by pooling resources for collaborative and complementary programmes for our students, researchers and staff.

<https://idealeague.org/>

The Partners



TU Delft

ADDRESS

Mekelweg 5, 2628 CD Delft
The Netherlands



ETH Zurich

ADDRESS

Rämistrasse 101, 8092 Zurich
Switzerland



RWTH Aachen

ADDRESS

Templergraben 55, 52062 Aachen
Germany



Politecnico di Milano

ADDRESS

Piazza Leonardo da Vinci 32, 20133 Milano
Italy



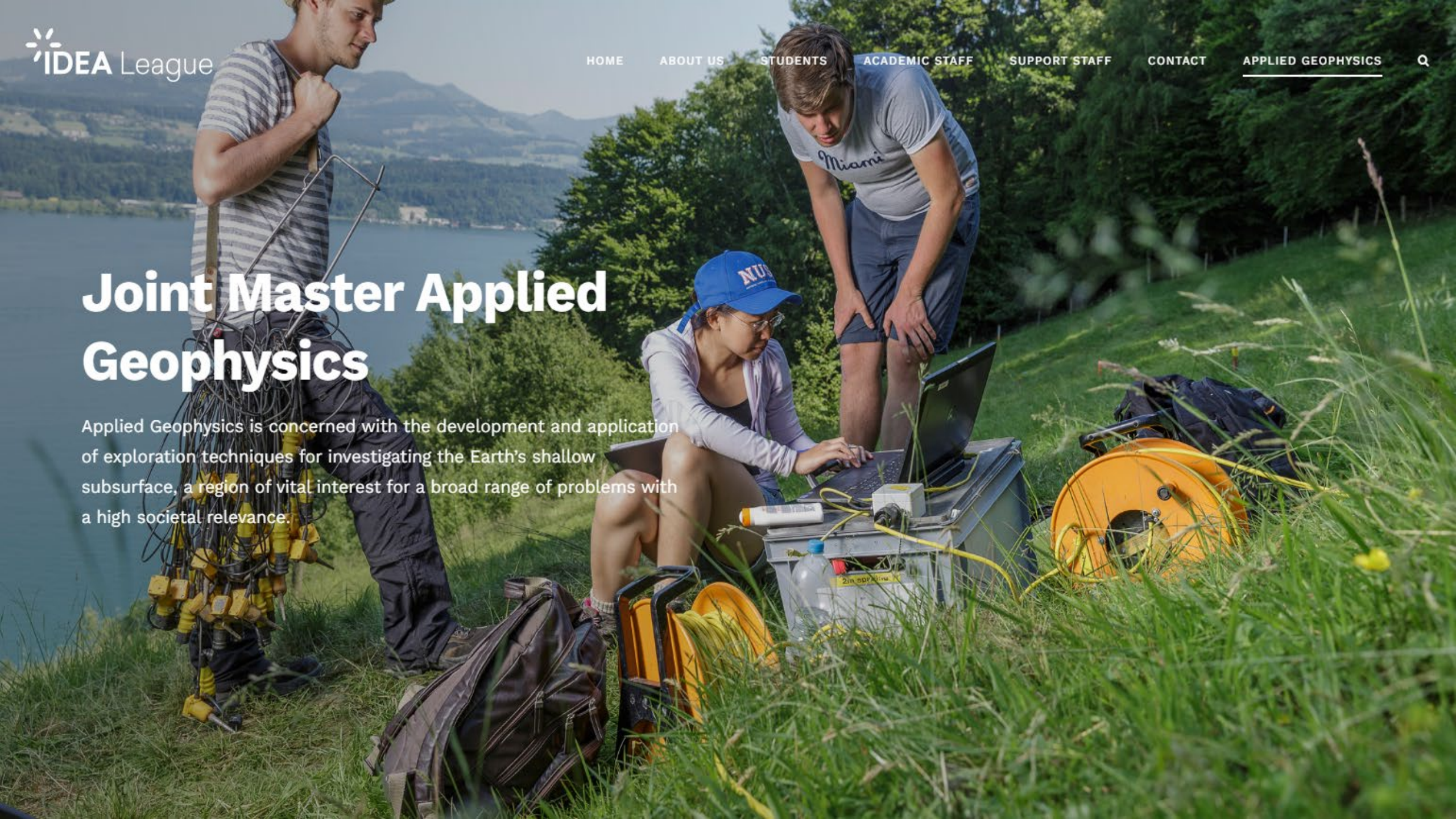
Chalmers University of Technology

ADDRESS

Maskingränd 2, 412 58 Göteborg
Sweden

Joint Master Applied Geophysics

Applied Geophysics is concerned with the development and application of exploration techniques for investigating the Earth's shallow subsurface, a region of vital interest for a broad range of problems with a high societal relevance.





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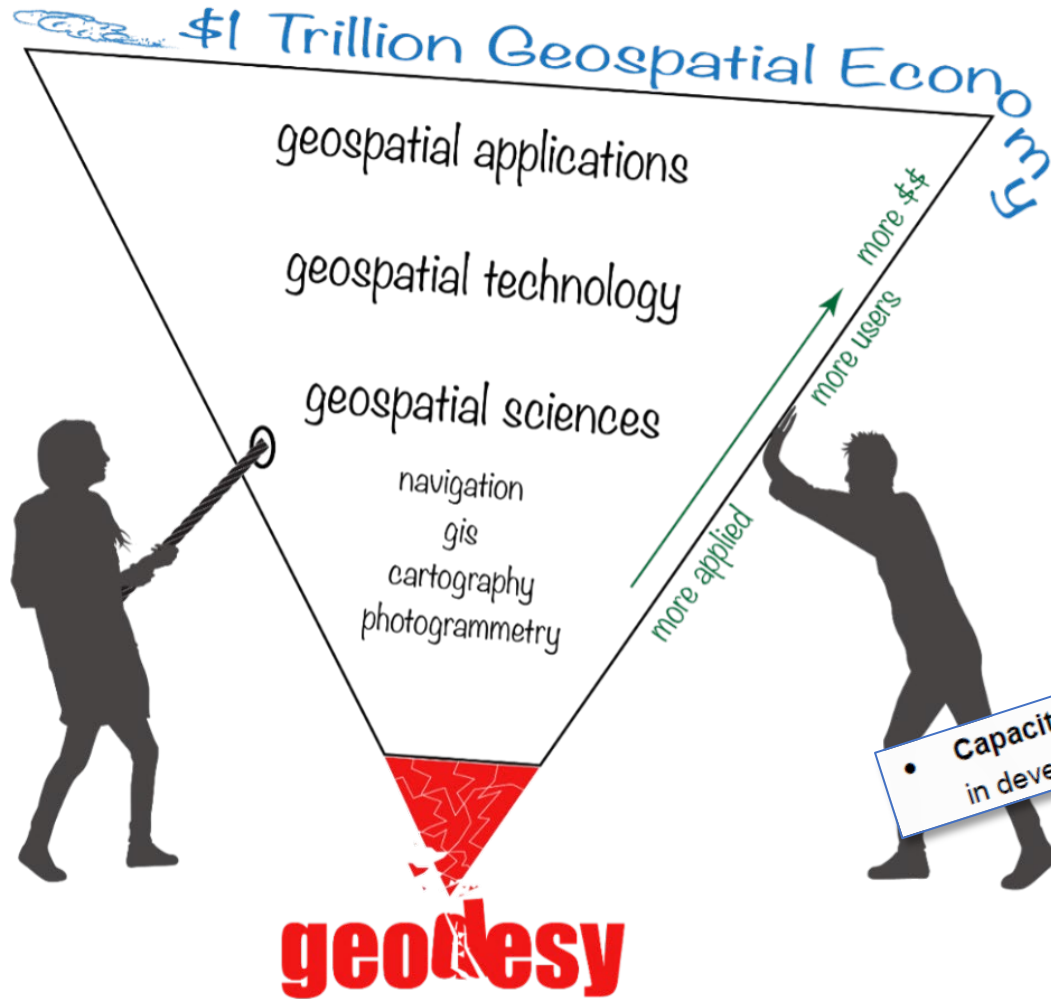


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The inverted geospatial pyramid



The entire geospatial economy is supported by geodesy!

Bevis et al., 2022

America's loss of capacity and international competitiveness in geodesy, the economic and military implications, and some modes of corrective action

Michael Bevis
Ohio Eminent Scholar & Prof. of Geodesy
Ohio State University

Chris Jekeli
Professor Emeritus of Geodesy
Ohio State University

C.K. Shum
Professor of Geodesy
Ohio State University

Dave Zilkoski
Former Director of the
National Geodetic Survey

Richard Salman
Former Director, NGA
Office of Geomatics

William Carter
Former Chief of Research at
the National Geodetic Survey

James Davis
Lamont Research Professor
Columbia University-City of New York

Thomas Herring
Professor of Geodesy
MIT

Craig Glennie
Prof. of Geodetic Engineering
University of Houston

David Sandwell
Professor of Geodesy, UCSD
and National Academy of Sciences

Stephen Hilla
Former Chief of Research at
the National Geodetic Survey

Yehuda Bock
Distinguished Research Geodesist
Scripps Institution of Oceanography

Ken Hudnut
Former Geophysicist at the
US Geological Survey

Jeff Freymueller
Professor of Geodesy
Michigan State University

John Factor
Former Geodesist at
NGA Office of Geomatics



United Nations
Global Geodetic
Centre
... Excellence

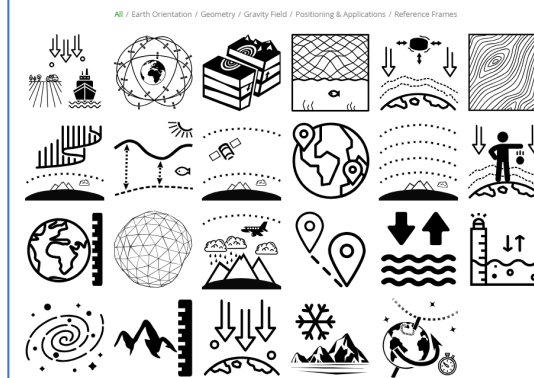
Capacity: Enhance geodetic capacity and training opportunities in Member States, especially in developing countries.

Strategy and Operating Plan

Version 1.0: 11.12.2023

PUBLIC RELEASE VERSION

Geodetic Product List



SUSTAINABLE DEVELOPMENT GOALS

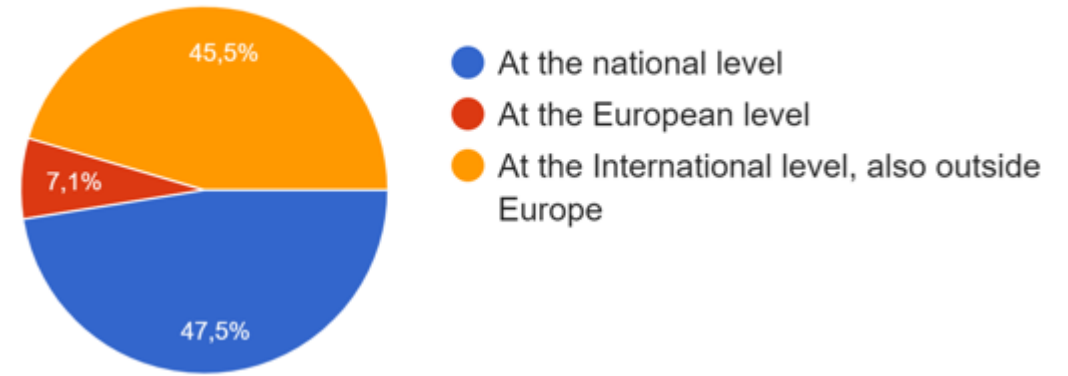


Questionnaire, sent to stakeholders in the Geodetic job market

- ~100 respondents (still open for input)
- 72% perceived the current availability of MSc graduates in Geodesy to be unsatisfactory.
- 83% expects the demand for (academic) professionals with expertise in Geodesy to grow in the foreseeable future



At what level is your organization active?



Netherlands: 49: Fugro, CGI, Shell, ESRI, Defense Min (DoD), Cadastre, Survey Dept, BAM, Boskalis, Sweco, Van Oord, WSP, SpaceOffice, Municipalities, Geological Survey, ProRail, Cyclomedia, various SME's, survey companies

Switzerland: 5: Hexagon, Helimap, Geomatic + Survey Zurich, Terradata, Swisstopo

Sweden: 3: Lantmäteriet, National Mapping Cadastral and Land Registration Authority

Italy: 2: OGS, G-RED

Other: 19: Danish Agency for Data Supply and Infrastructure, BKG, DLR, Kartverket

Unknown: 21

72% perceives current availability of (academic) geodesists as insufficient. Why?

What are the challenges or gaps that you face in recruiting qualified geodetic professionals?

1. Cannot find graduates with proper geodetic background
2. Not enough applicants from own country, not enough young graduates available
3. There is no formal program in NL as far as I know
4. It is very hard to find professionals with an interest and skill in data acquisition technologies. High need for new geodetic professionals.
5. There are too few
6. All our geodetic personnel is 40+
7. There are no applicants
8. Only one university in my country has a geodesy degree and it produces very few candidates a year.

15. There are very few qualified professionals in the field of GNSS. Although not specifically Geodesy, a background in Geodesy would make applicants much more directly suitable for our field. We currently hire mainly "fresh" students with a masters degree in physics, aerospace engineering or similar. Hiring experienced medior or senior personnel is nearly impossible.

16. Recruiting qualified geodetic professionals presents several significant challenges and gaps, which impact our ability to build a robust team capable of advancing our R&D initiatives. These challenges include: **Limited Talent Pool**: The field of geodesy is highly specialized, resulting in a relatively small number of professionals

Especially with a solid geodetic background and experience.

62. less applicants, quality of students from abroad, e.g., related to coding, background in physical and satellite geodesy

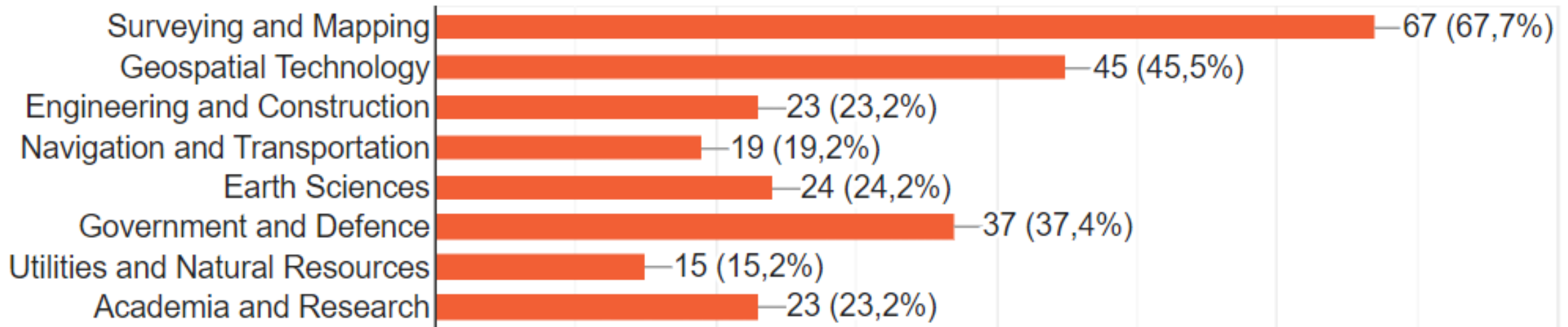
63. Too few persons graduate; but there are also too few potential students that apply to the master programs that exist, so the programs do not fill their seats and thus have problem with economy.

64. Being open to field work, travel.

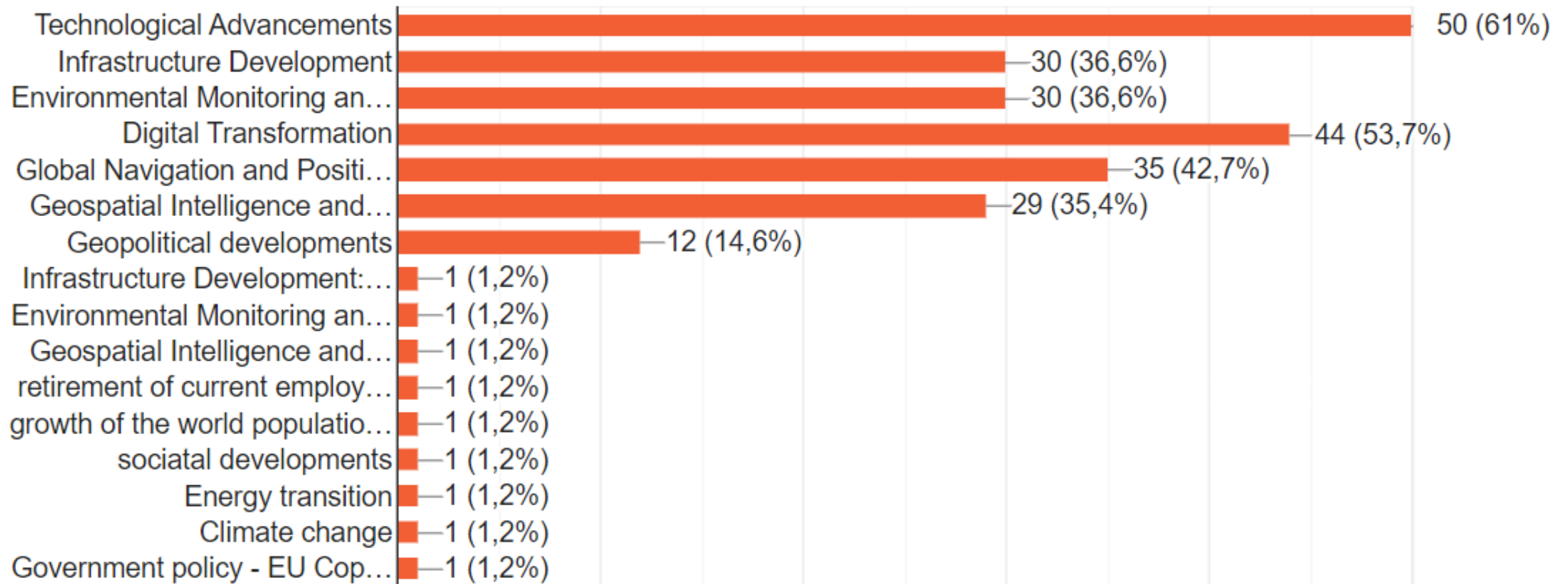
65. Very limited amount of students for full time jobs and internships. Hard to fill vacancies, and even harder to have a choice between multiple applicants.

Stakeholders background

Geodetic MSc graduates work in a variety of industries and sectors, thereby contributing to various scientific, engineering, and societal endeavors. In which field is your organization active?



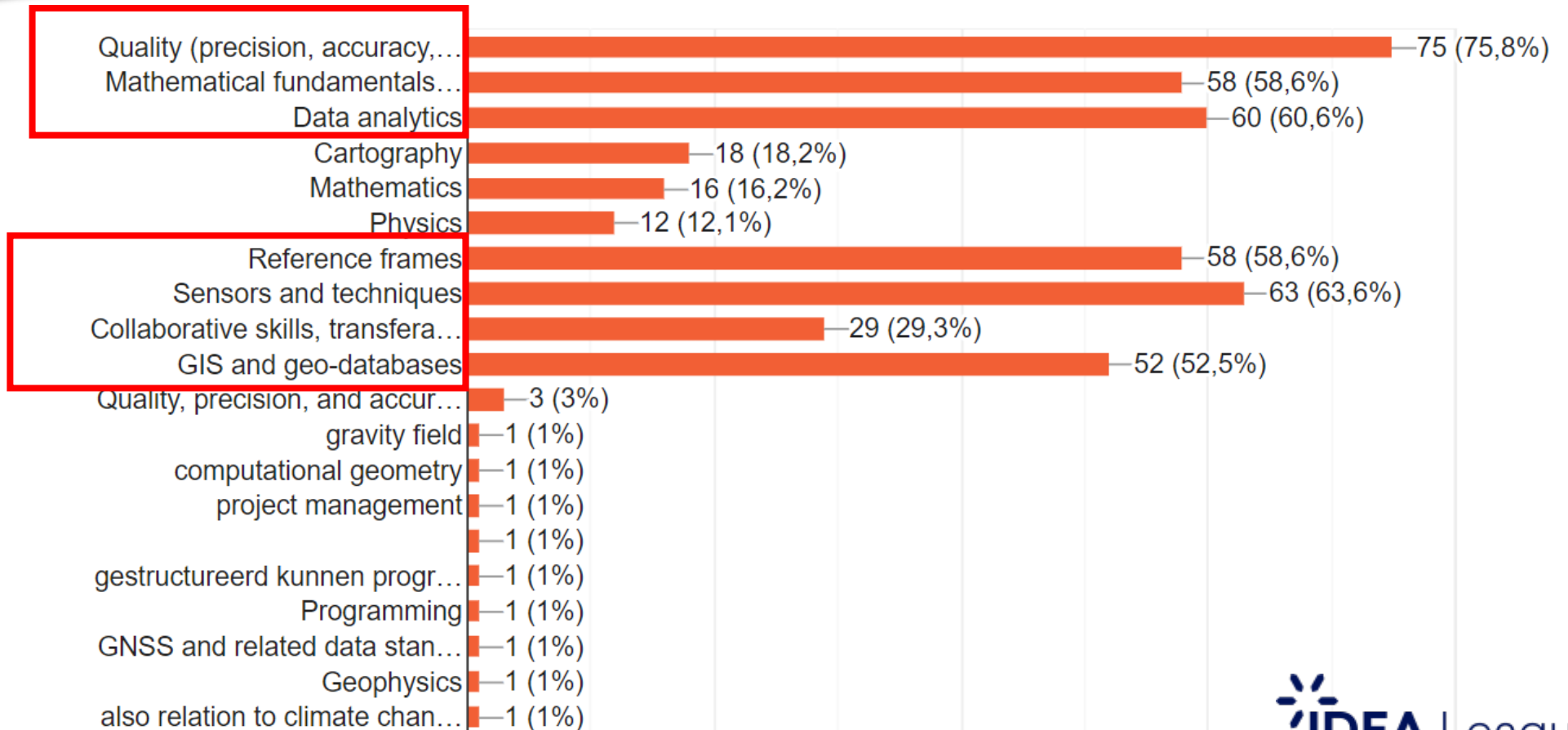
83% of stakeholders think demand for geodesists will grow. Why?



(respondents had to choose three items)

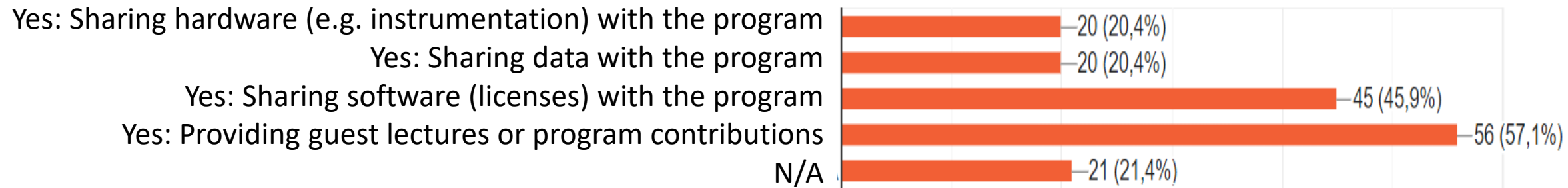
Expertise needed

What should in your opinion be the expertise of geodesists you need? (Academic level) Select the five skills/fields that should definitely be in the program.



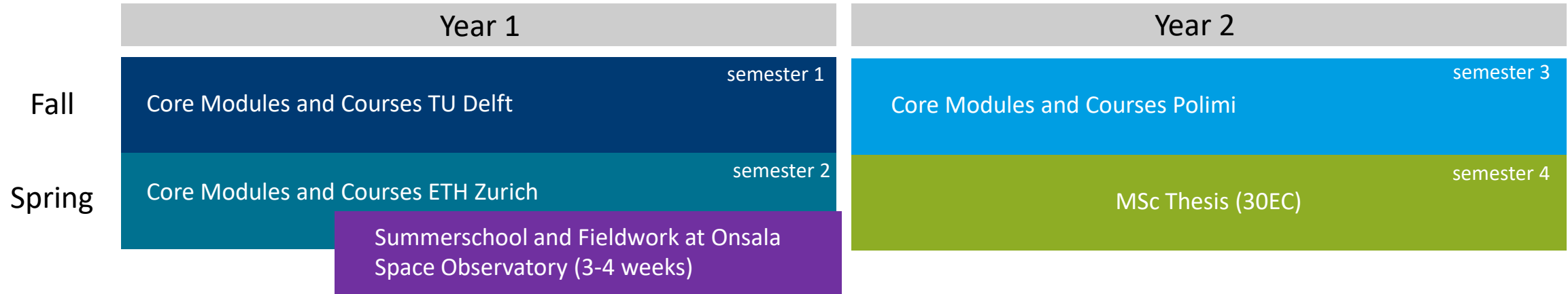
Stakeholders want to support!!

Would your organization be willing to make resources or support available to a new MSc program in Geodesy?



- “Sharing data”
- “ Yes: Providing guest lectures or program contributions, sharing data from projects/campaigns”
- “ software licenses would be possible but at the company's premises”
- “ Tutors”
- “ we could provide insight in why applied geodesy is important for us and in what context ”
- “Sharing data focused on geodetic infrastructure, data for specific projects or third-party data needs good agreements”
- “Support depends on how everything is organized. If we were a regular partner of this joint Masters program, we could contribute much more.”

Programme overview MSc Geodesy (Draft!)



In this programme we distinguish Core Modules, Electives, Practical work, and the Graduation thesis:

TU Delft

Core modules (3 out of 3 must be passed):

1. Observation Theory
2. Reference Systems
3. Satellite Earth Observation

Electives:

1. Positioning, Navigation and Timing
2. Microwave Remote Sensing
3. Gravimetry

MSc Thesis

The MSc thesis can be written at one of the four partner universities, or in collaboration with industry

ETH Zurich

The Core Module of Block 2 consisting of

1. Photogrammetry
2. Geosensors and Engineering Geodesy
3. Space Geodesy

Electives:

1. Computer Science for Geodesy
2. Multivariate Statistics and Machine Learning
3. Fundamentals of GIS and Cartography

MSc Thesis

The MSc thesis can be written at one of the four partner universities, or in collaboration with industry

Polimi Milan

Core modules (3 out of 3 must be passed):

1. Geospatial Data Analysis
2. Location-Based Services
3. Surveying, Monitoring and Land Modeling

Electives:

1. Geoinformatics Engineering
2. Geophysical Geodesy
3. Computer vision

MSc Thesis

The MSc thesis can be written at one of the four partner universities, or in collaboration with industry

Chalmers, Onsala

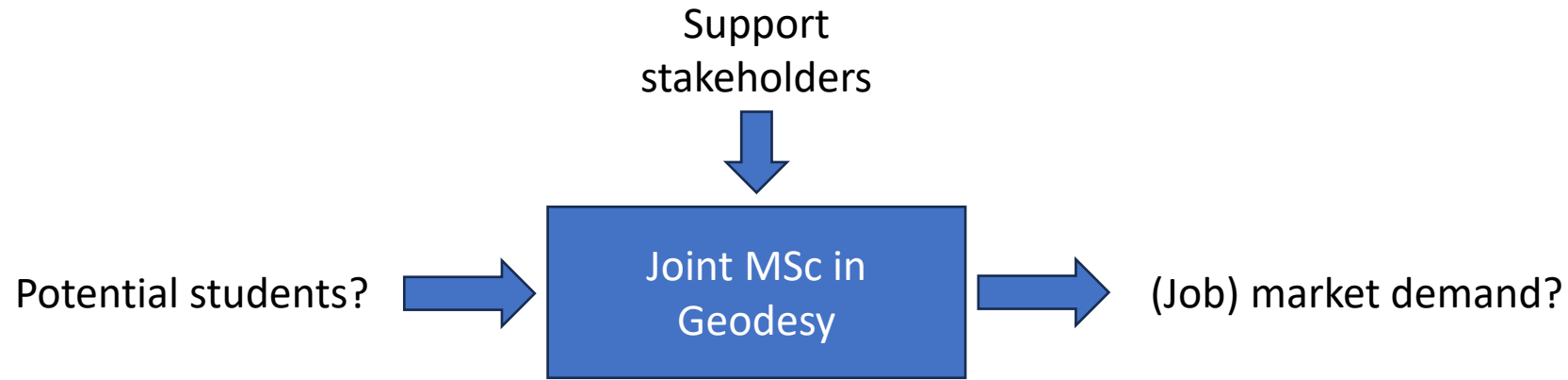
Core modules (3 out of 3 must be passed):

1. Operational Space Geodetic Techniques
2. Fieldwork, data collection and analysis

MSc Thesis

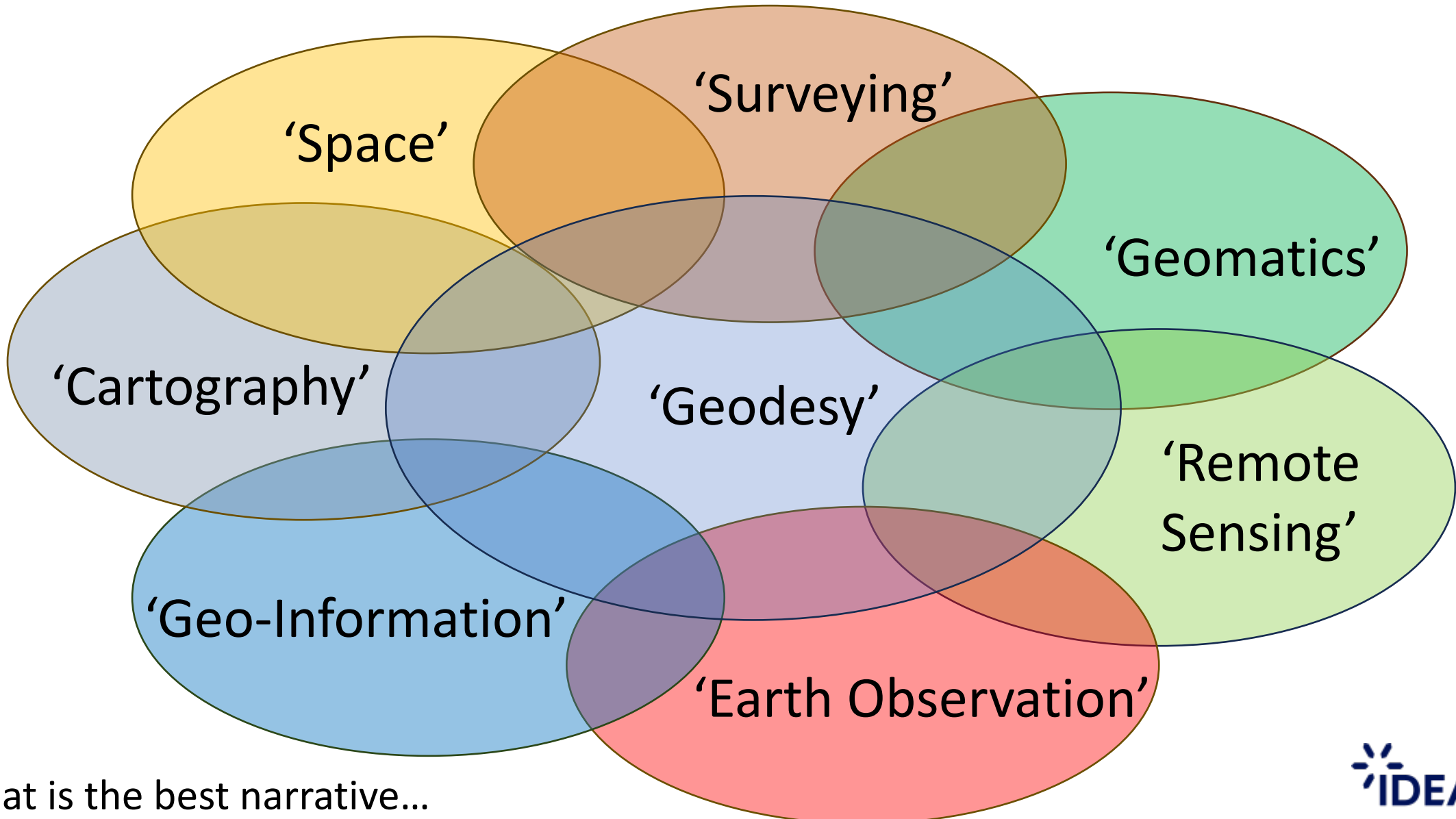
The MSc thesis can be written at one of the four partner universities, or in collaboration with industry

Challenges ahead: approval, accreditation



- Approval by four university boards (rectors):
 - viability
 - number of potential students? (we aim for 30/y)
 - complementarity/overlap with existing programs
 - exploit the link with 'space'
- Modus-operandi collaboration energy sector (polarization)

Challenges ahead: diffuse landscape



...what is the best narrative...

Summary

Main goal:

Train a sufficient number of geodesists, at the academic (MSc) level, to respond to the urgent needs of society

Our proposition:

1. Establish a joint international European MSc program in Geodesy
2. Combine resources of universities, scientists, and educators in Europe
3. Respond to the urgent need for academic geodesists
4. Inspirational collaboration via complementary fields,

Envisioned time frame: start September 2026. First graduates summer 2028

Feedback requested, discussion

- how can we achieve our goals, and tackle the challenges?
- suggestions for support letter organizations
- suggestions for scholarship sources (cadastre, government, industry,...)
- How can we ensure sufficient interest from students?
- Fill in the questionnaire...



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