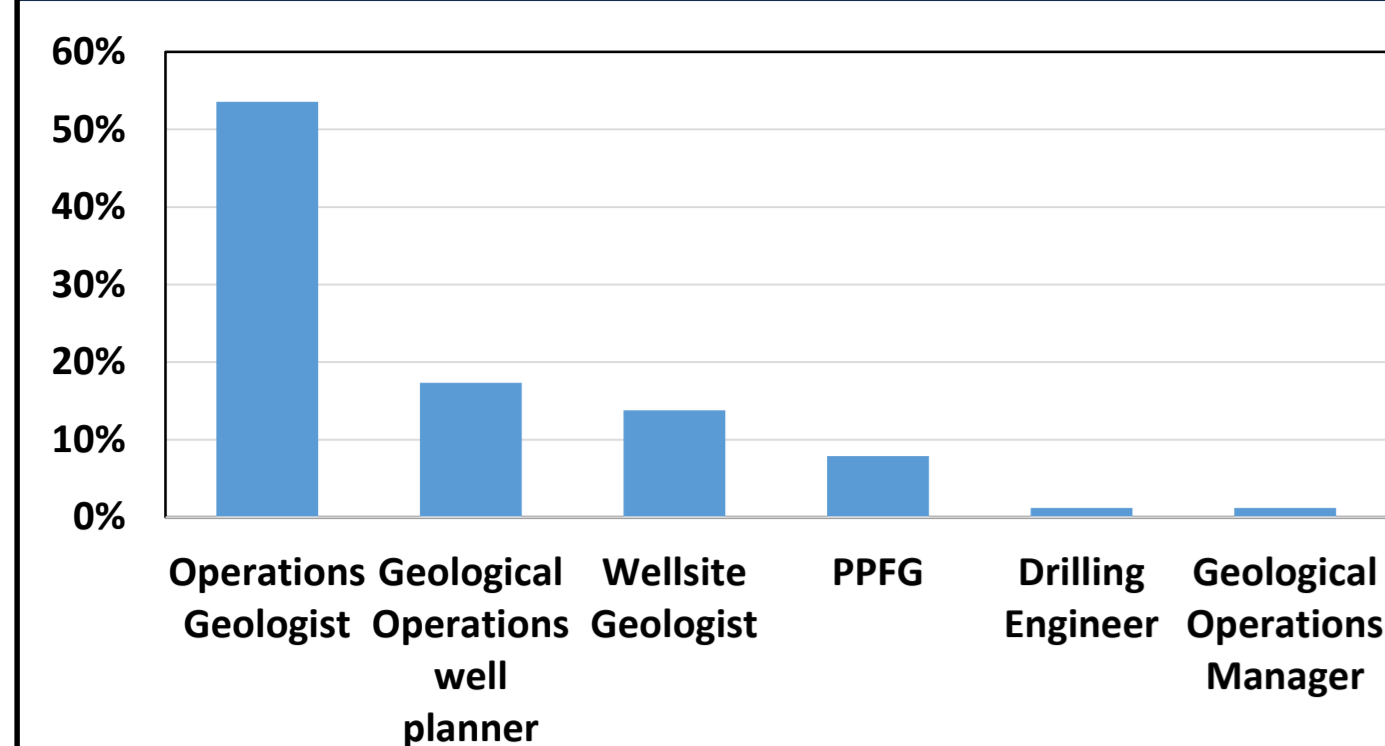


Results of the Wellsite Geology Survey 2017/18

Part 1

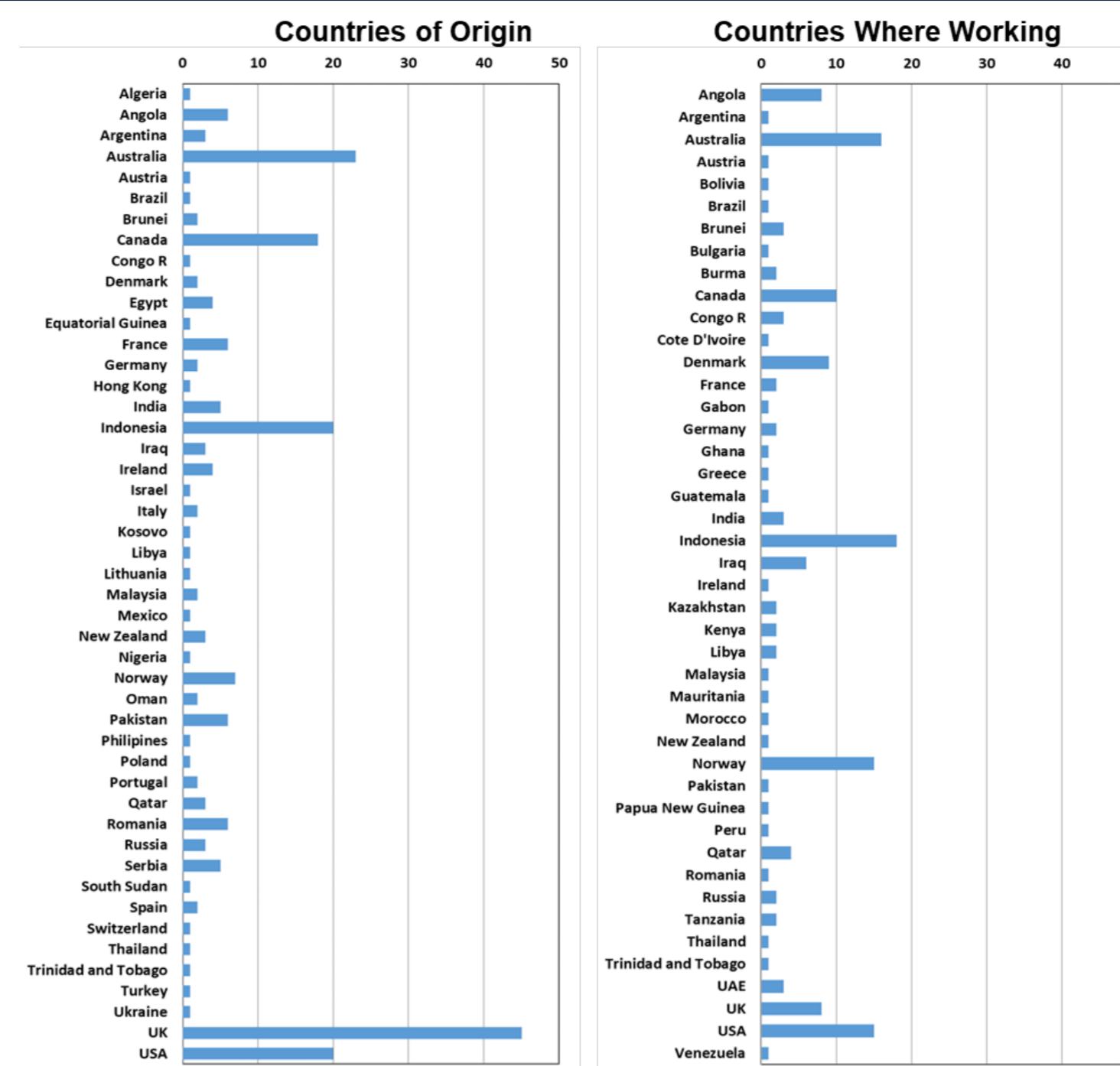


About the Survey

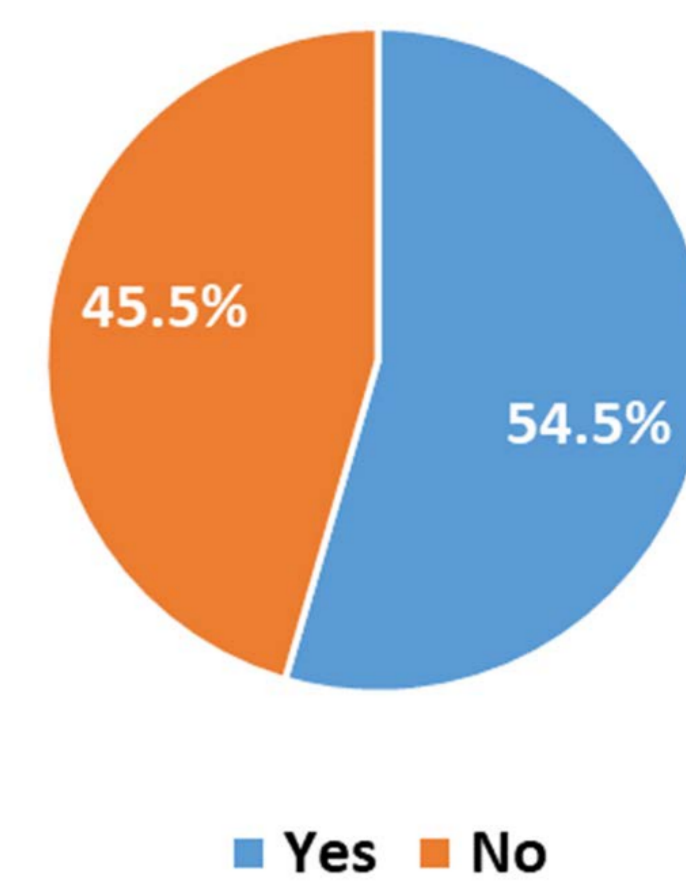
- Take a snapshot of wellsite geology in 2018 and help to raise its profile.
- Get some hard data about the discipline.
- Survey completed using SurveyMonkey, an online commercial service.
- Responses are anonymous. Survey URL distributed and forwarded via e-mail, LinkedIn and through the GS mailing list.
- Time frame 27th June 2017 to 19th February 2018 (237 days).
- 285 total responses, 165 complete responses, some partial.
- Average completion rate 58%, average completion time 28 minutes.
- Results are a 'good indication' at best, probably not statistically robust.

About the Respondents

- All wellsite geologists, 38% had worked as operations geologist previously
- 22% of respondents have had 1 or more times out of the industry
- 47 countries of origin.
- 55% working on a well in the same country as working.



Are you working on a well in the same country where you live?

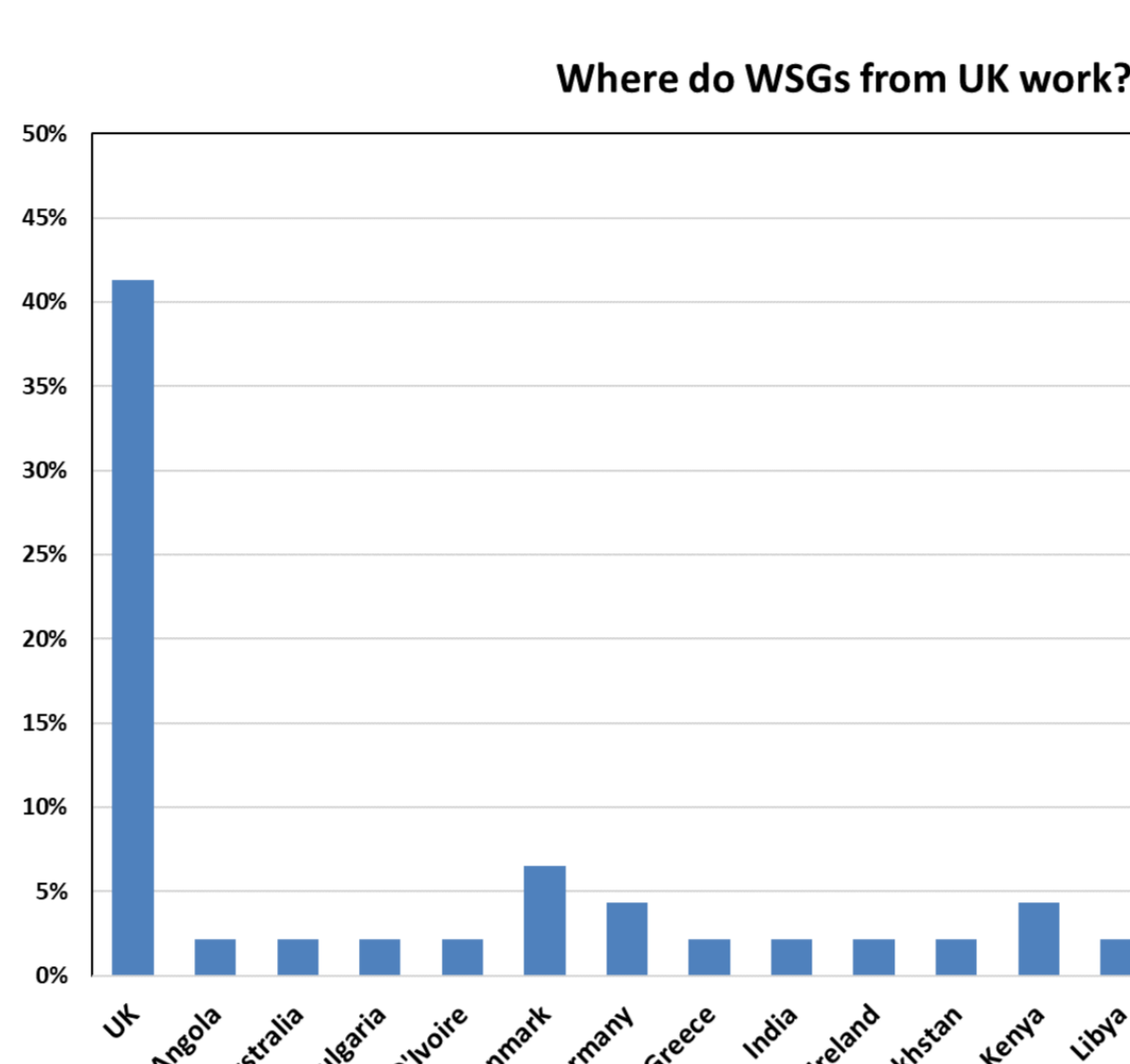


Thanks to:

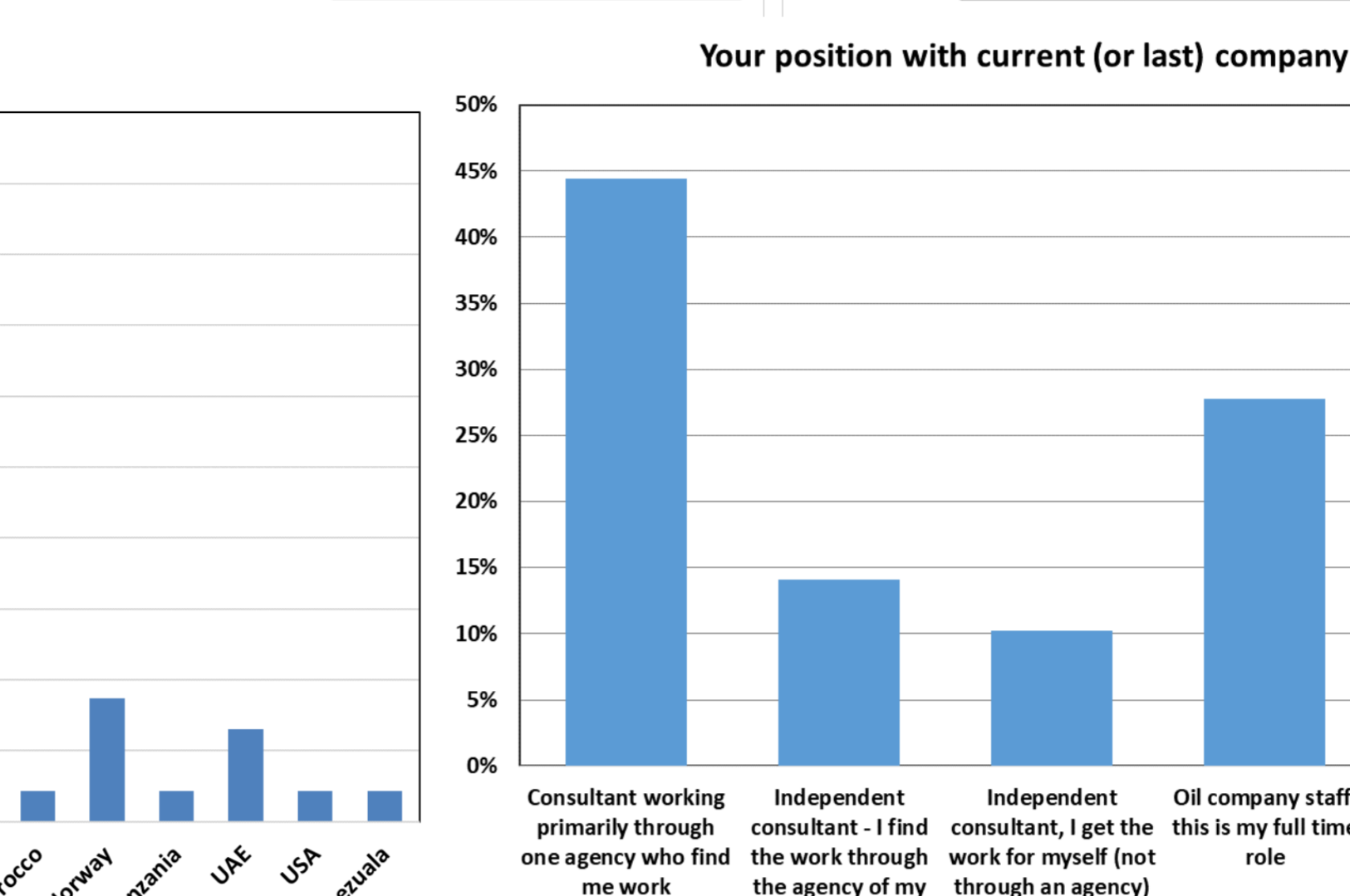
- Petroleum Group of the Geological Society for providing financial support for the use of SurveyMonkey.
- The rest of the convening committee for their suggestions and support.
- And chiefly yourselves for completing the survey.

Wellsite Geology

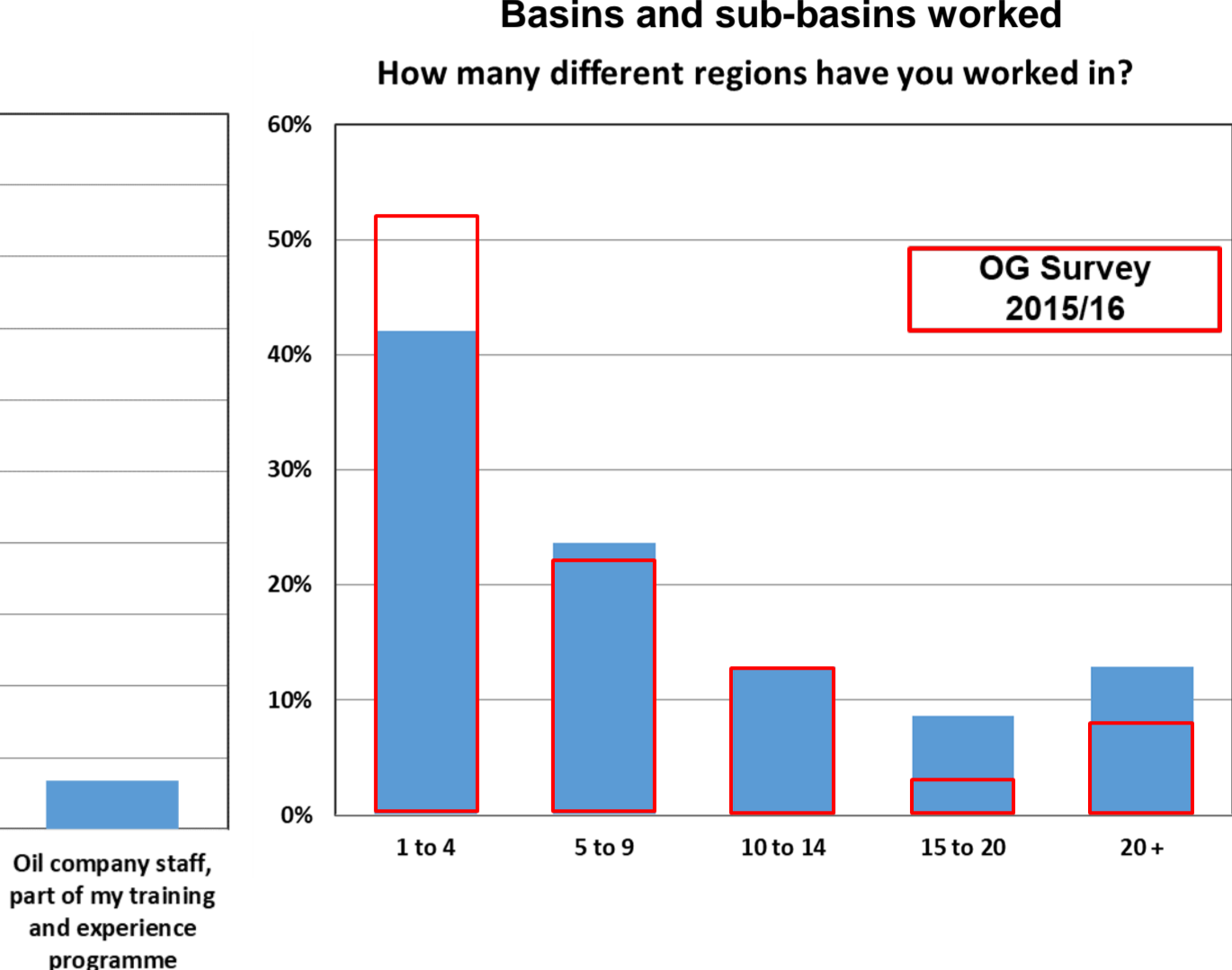
- Wellsite geology has been the traditional and important stepping stone between mudlogging and operations geology but that is starting to change.
- The role of the wellsite geologist has gradually evolved over the years. The advent of a range of downhole tools and rapid digital communications has resulted in:
 - Wellsite geologists are increasingly data managers with huge volumes of data which needs to be QC'd and distributed.
 - Faster drill rates and longer bit runs resulting in increased workloads.
 - Autonomy becoming less, decision making is moving to the office.
- Wellsite geology has some important specialisms, need to understand:
 - PPFG - Wellsite evaluation of formation pressures including trend line analysis and use of indirect indicators such as gas events, caving, hole conditions etc.
 - Geomechanics - Awareness of the signs and root causes of wellbore instability and hole problems.
 - HTHP - The special requirements and processes of HTHP wells.
 - Geosteering - The processes of steering a well using downhole tools.
 - ERD - The procedures, tools and wellbore management of extended reach wells.
 - The principles of tools and processes of mudlogging, MWD/LWD, wireline and other wellsite services. Specialist witnessing of tools being run.
- The future of wellsite geology may be in mastering specialisms.



UK nationals work in a wide variety of countries around the world. Majority work outside the UK.

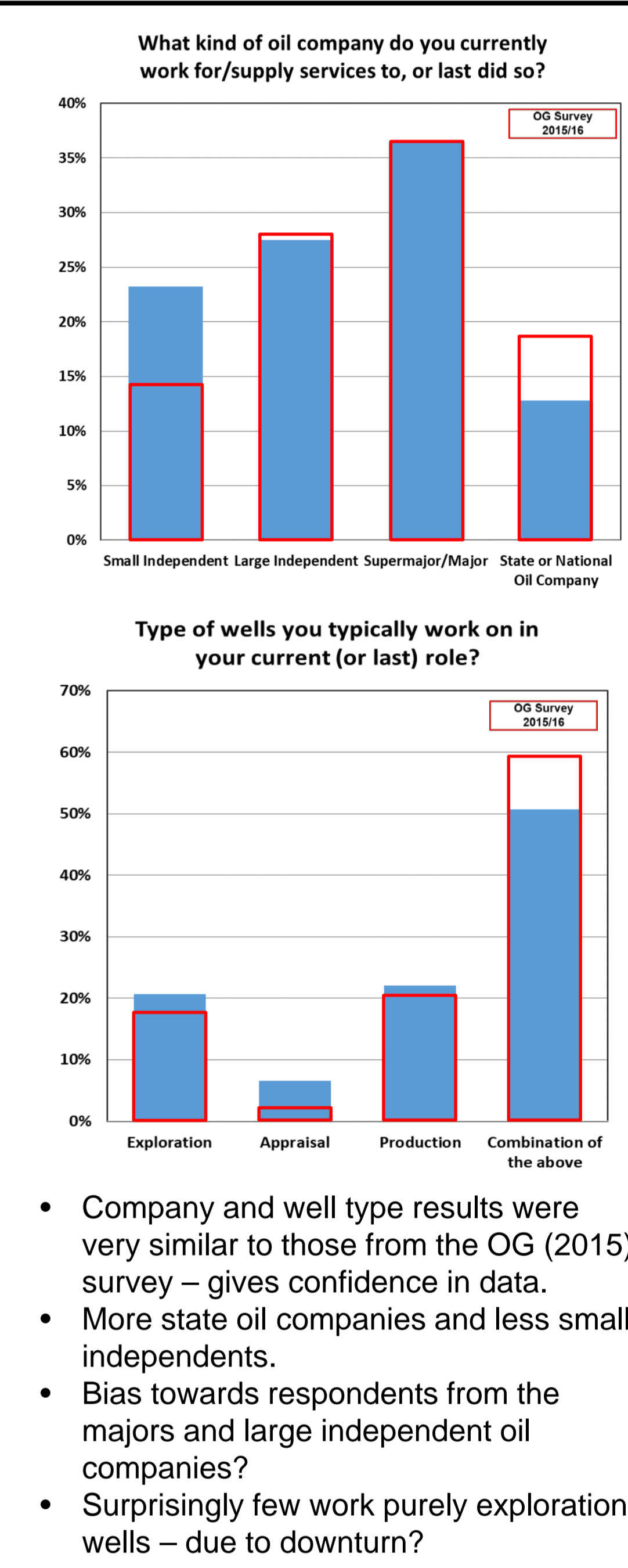
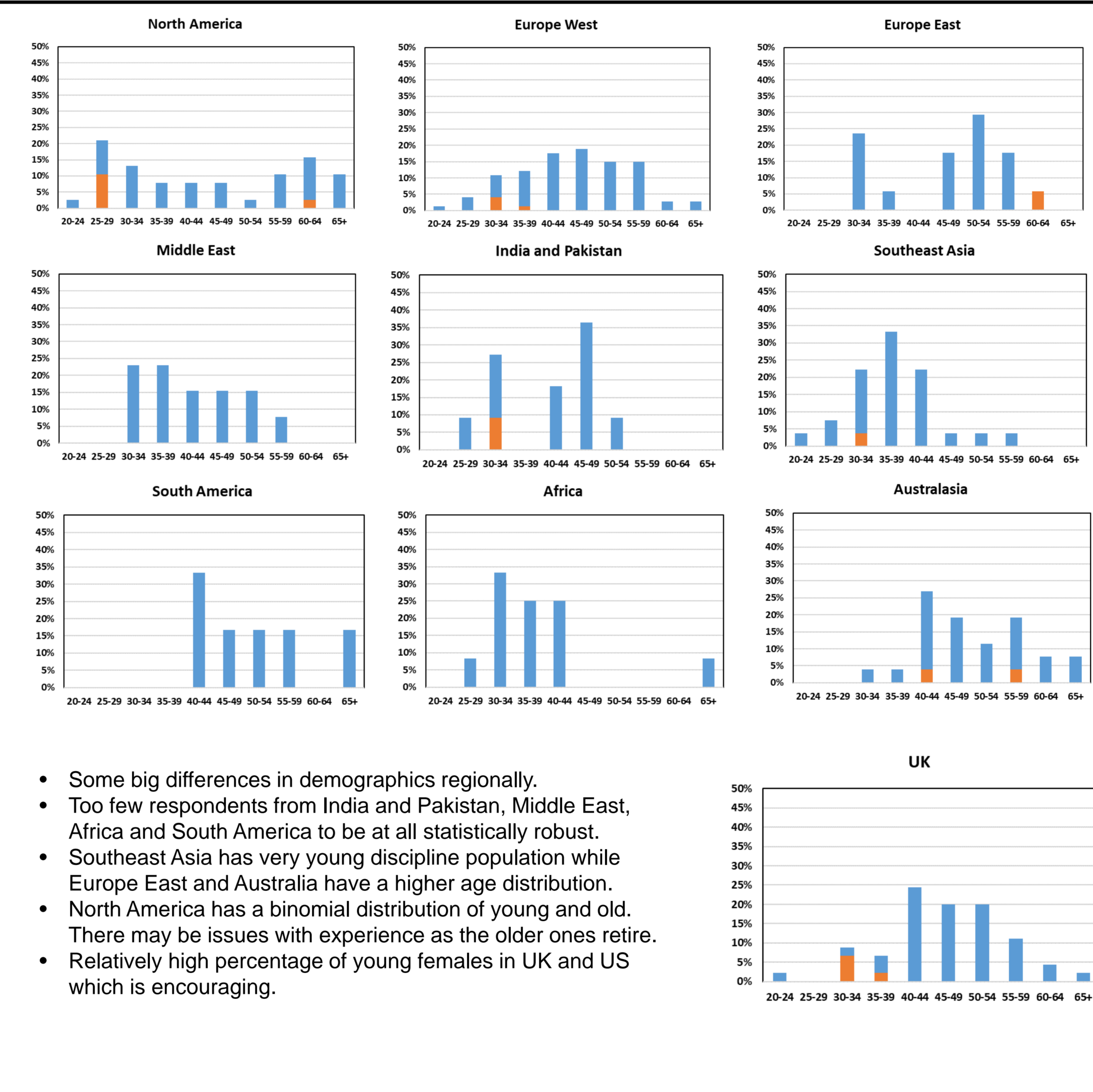
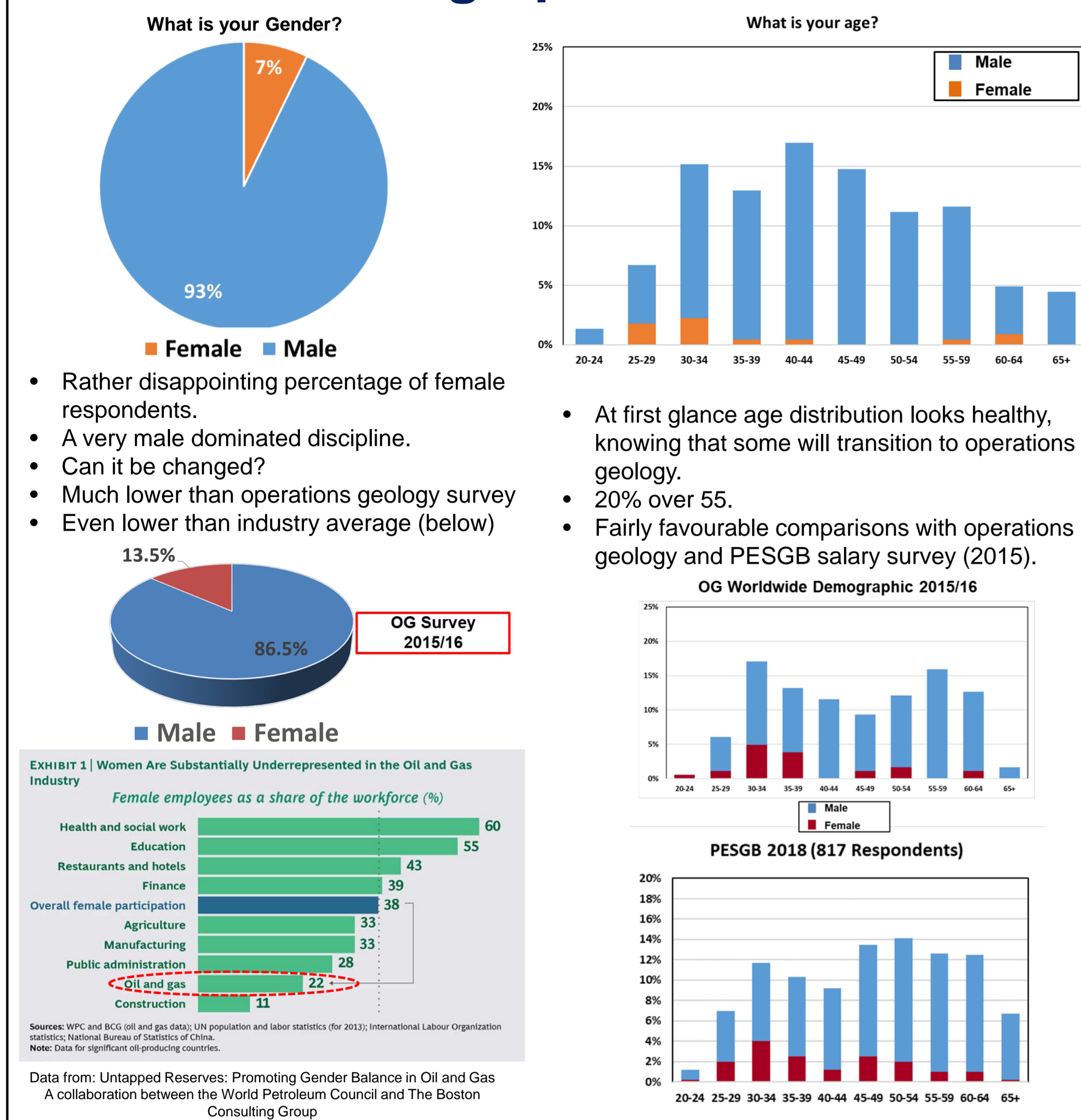


Staff wellsite geologists mainly India and Pakistan, Southeast Asia, Africa and Middle East. Generally staff WSGs 25% or less



WSGs seem to have wider spread of experience than OGs (red outline).

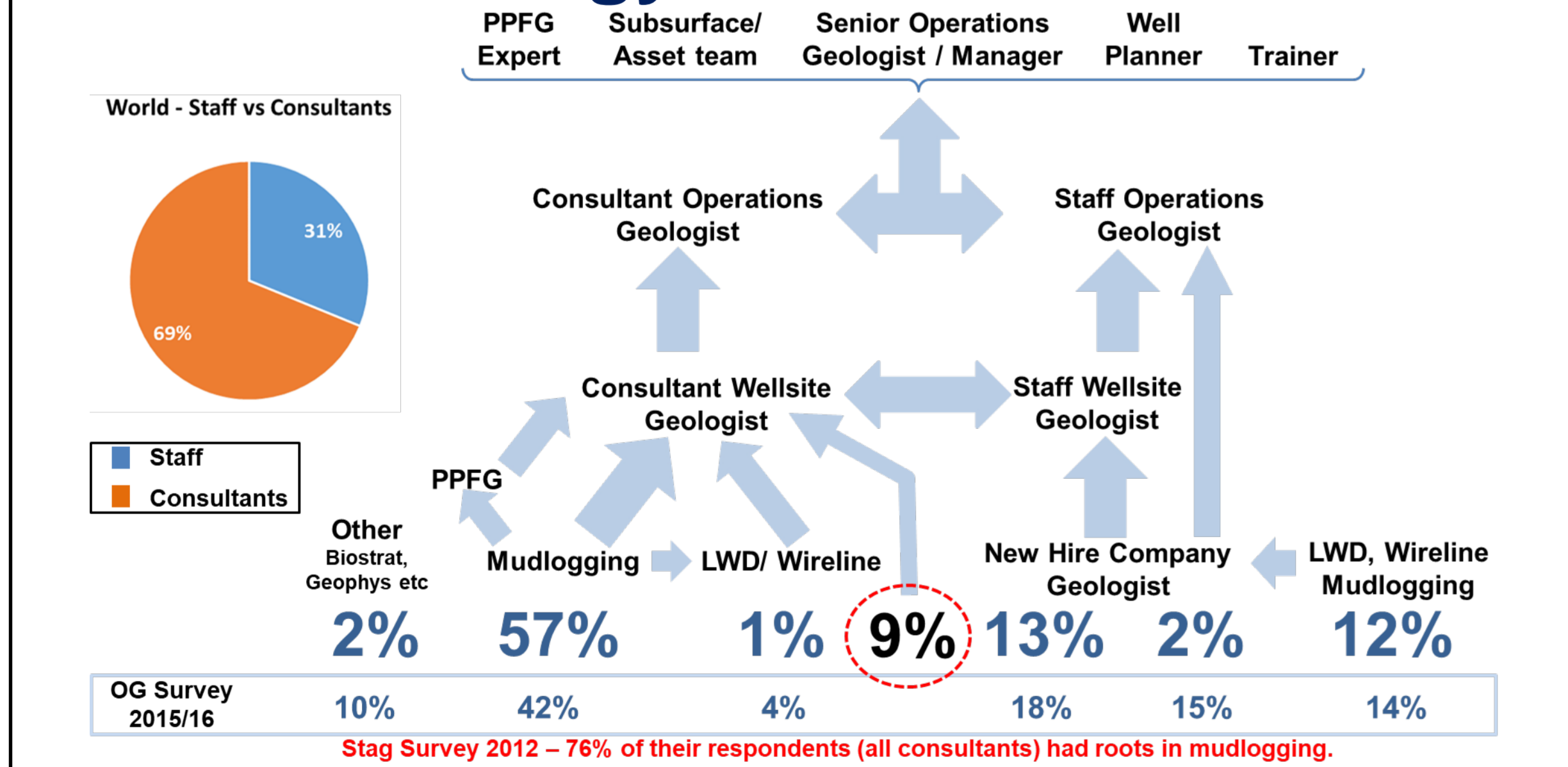
Gender & Demographics



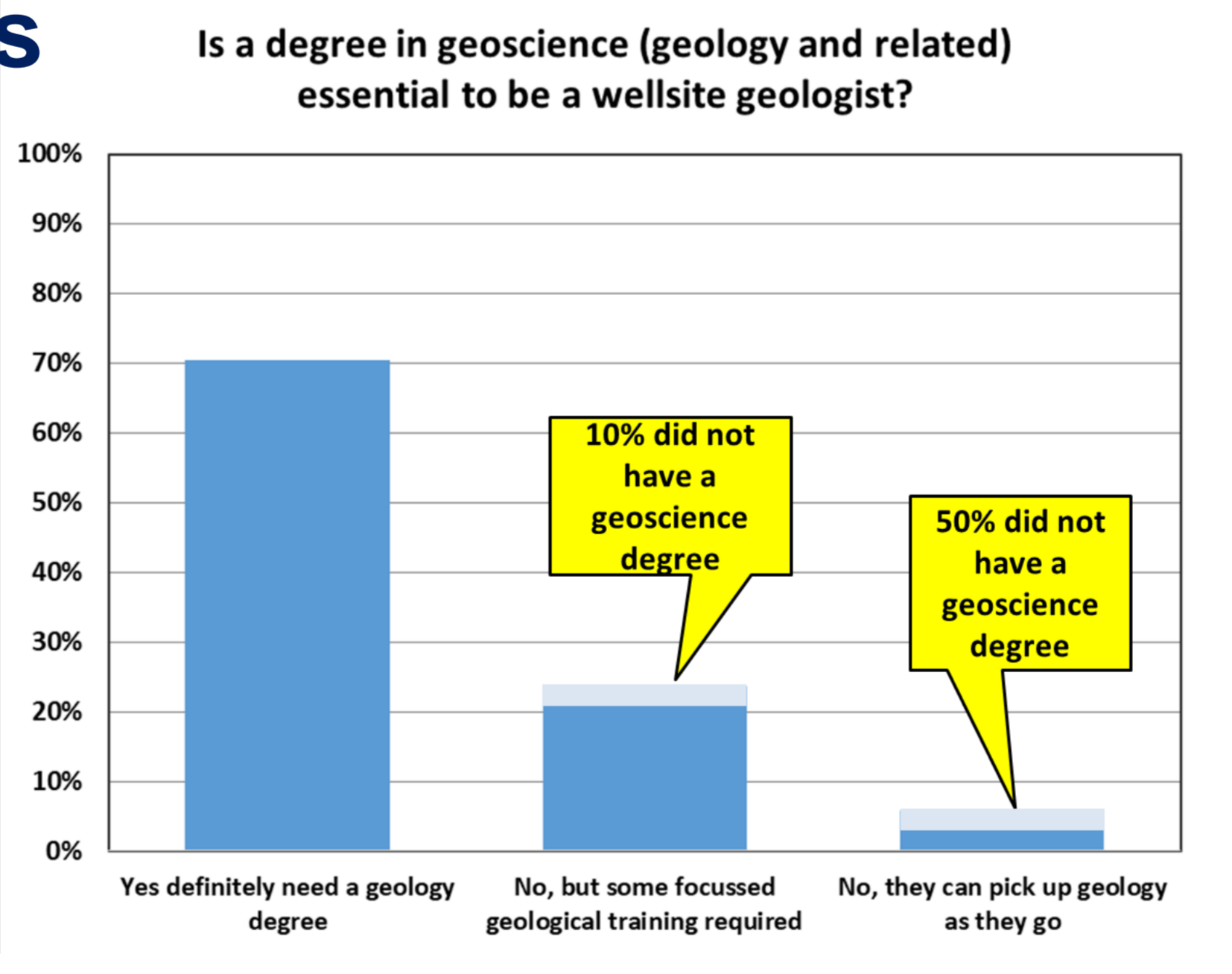
- Some big differences in demographics regionally.
- Too few respondents from India and Pakistan, Middle East, Africa and South America to be at all statistically robust.
- Southeast Asia has very young discipline population while Europe East and Australia have a higher age distribution.
- North America has a binomial distribution of young and old. There may be issues with experience as the older ones retire.
- Relatively high percentage of young females in UK and US which is encouraging.

- Company and well type results were very similar to those from the OG (2015) survey - gives confidence in data.
- More state oil companies and less small independents.
- Bias towards respondents from the majors and large independent oil companies?
- Surprisingly few work purely exploration wells - due to downturn?

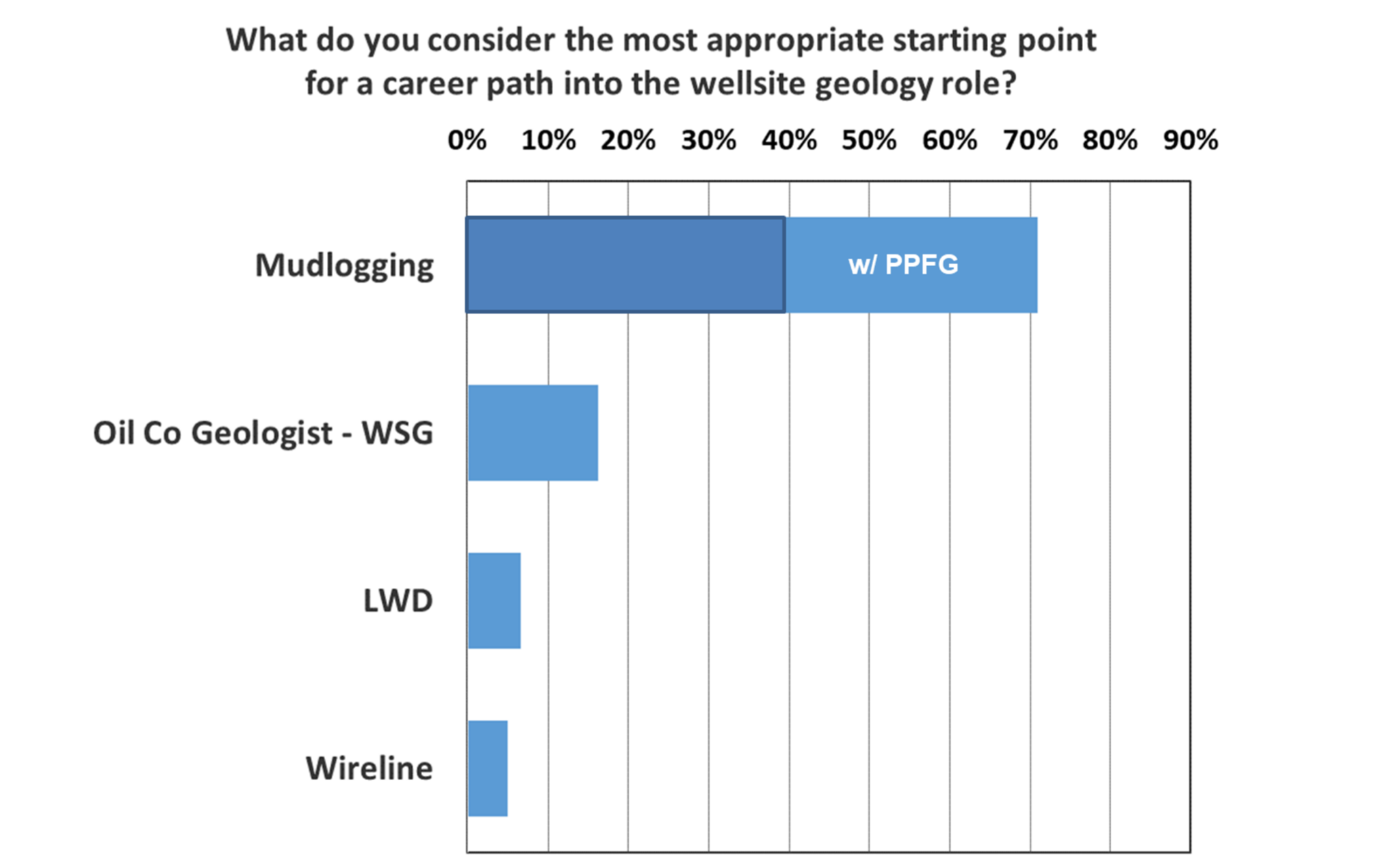
Wellsite Geology Career Paths and Roles



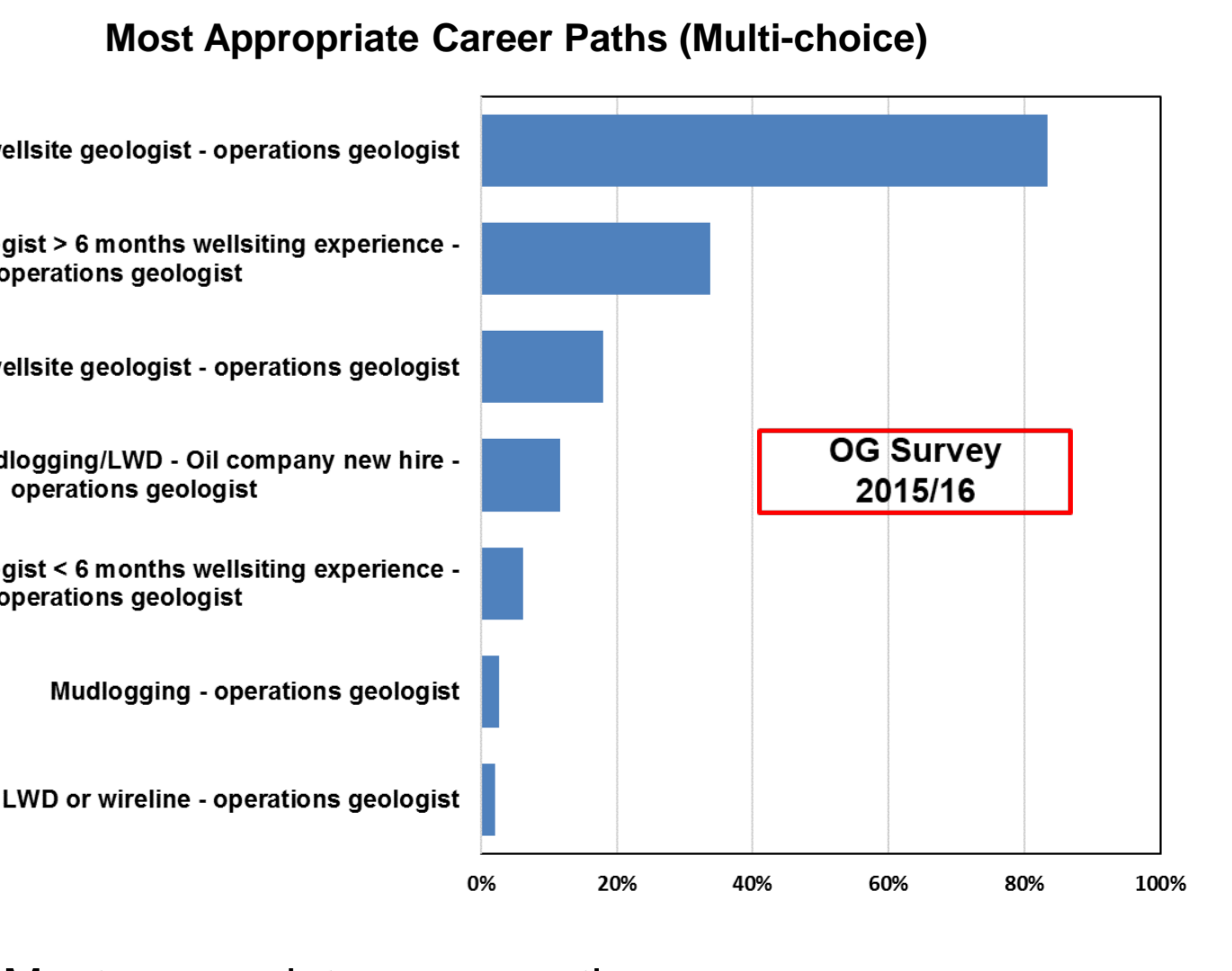
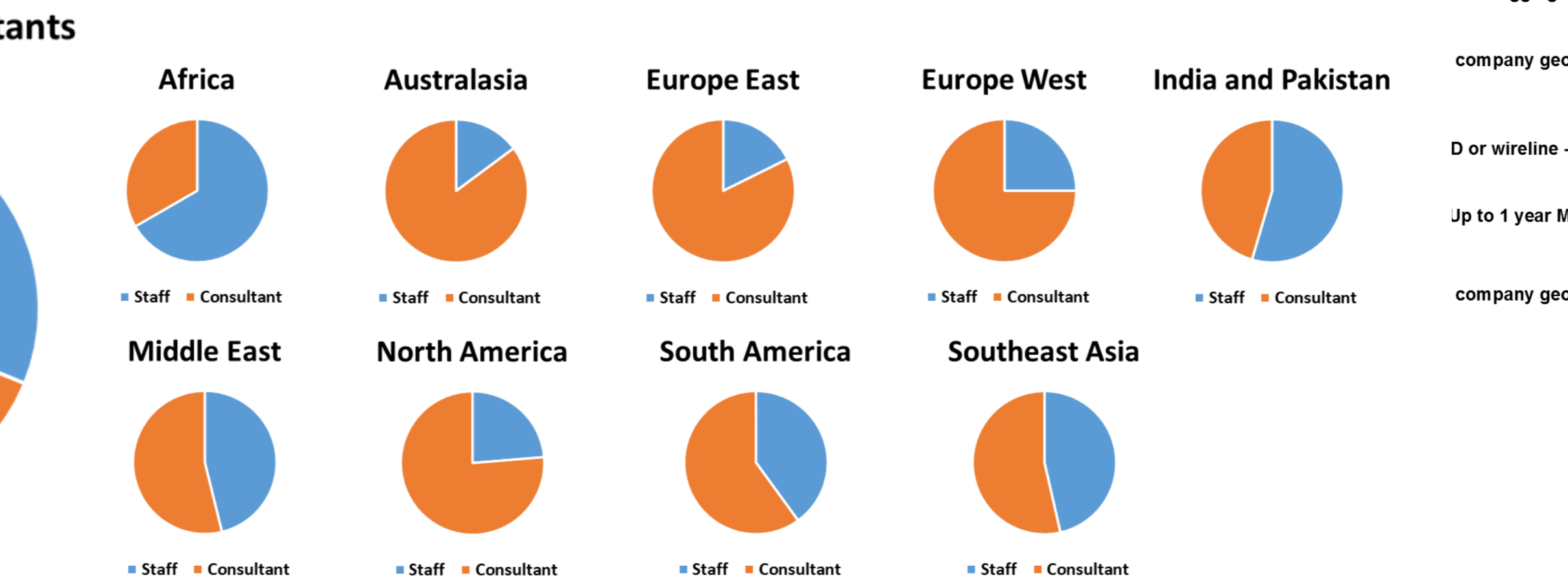
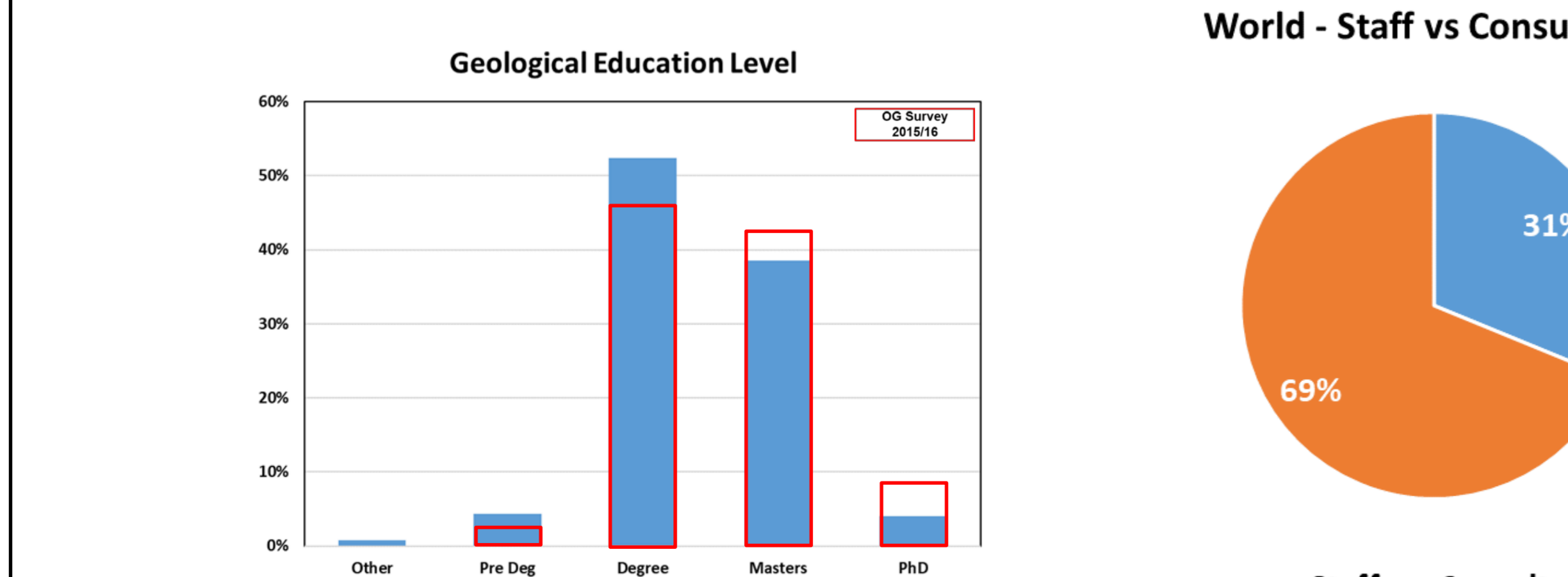
- Around 60% went via mudlogging to wellsite geology so it is still an important route.
- Percentage on each route are similar to the operations geology survey apart from the 9% who became wellsite geologists direct from other jobs or straight from college (not necessarily with a geology degree).
- Career origin in mudlogging much more common in Europe and Australia (70%).
- Rest of world less so (30-50%)



- Majority of respondents stated that a degree in geoscience was essential:
 - Not an overwhelming majority.
 - Half of those who said it was not essential did not have a degree in geoscience themselves.
 - Most of those saying 'no' were in the age range 20-35, and 55-59.



- Majority of respondents still believe that mudlogging (especially with PPFG experience) is by far the best way into wellsite geology.
- Ties in with findings of the operations geology survey (although a slightly different question was asked).



- Degree level is still the most common, slightly fewer higher degrees
- Evidence that some respondents, after an initial period of work, go back to college to obtain a higher degree, especially when there is an industry downturn.

- Two thirds of respondents were consultants but still a surprisingly large number of staff:
 - Issue of survey bias?
 - Actual trend to staff wellsite geologists as a first step to operations geology?
 - Some regional variations.

- Most appropriate career path:
 - Respondents again voted for their own route first.
 - If not first then mudlogging generally second choice.
 - Clear indication that mudlogging route was preferred.

Results of the Wellsite Geology Survey 2017/18

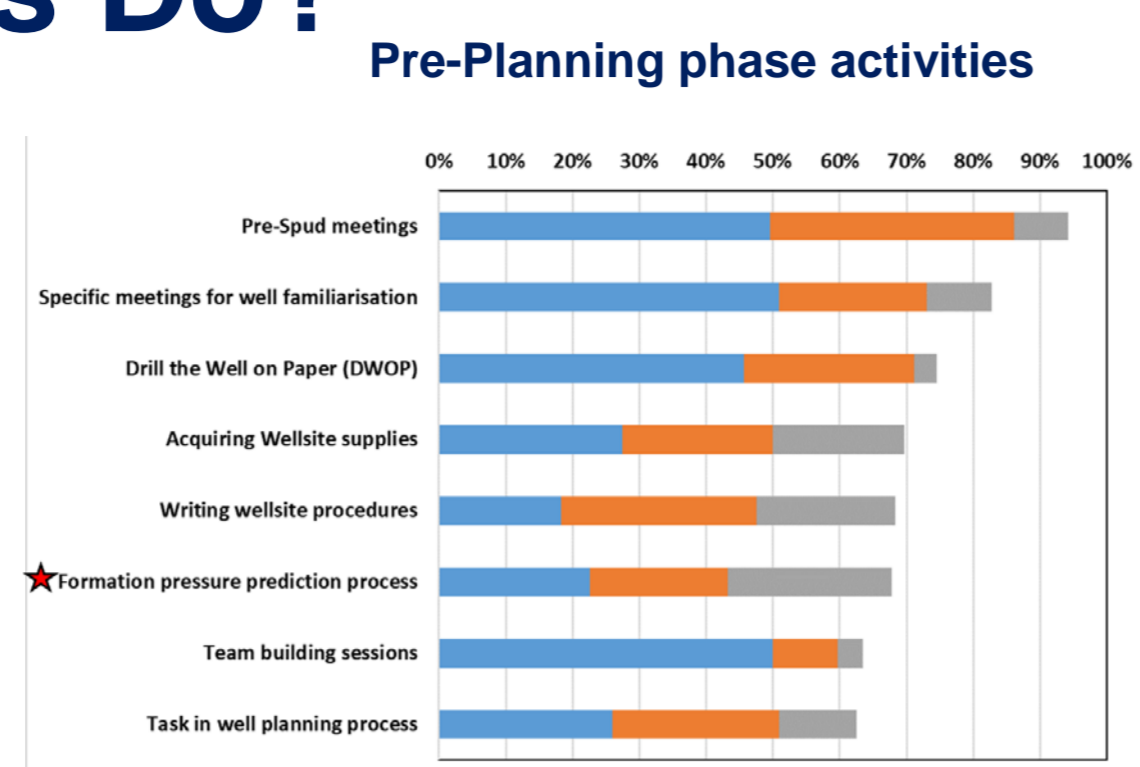
Part 2



Tim Herrett Ltd

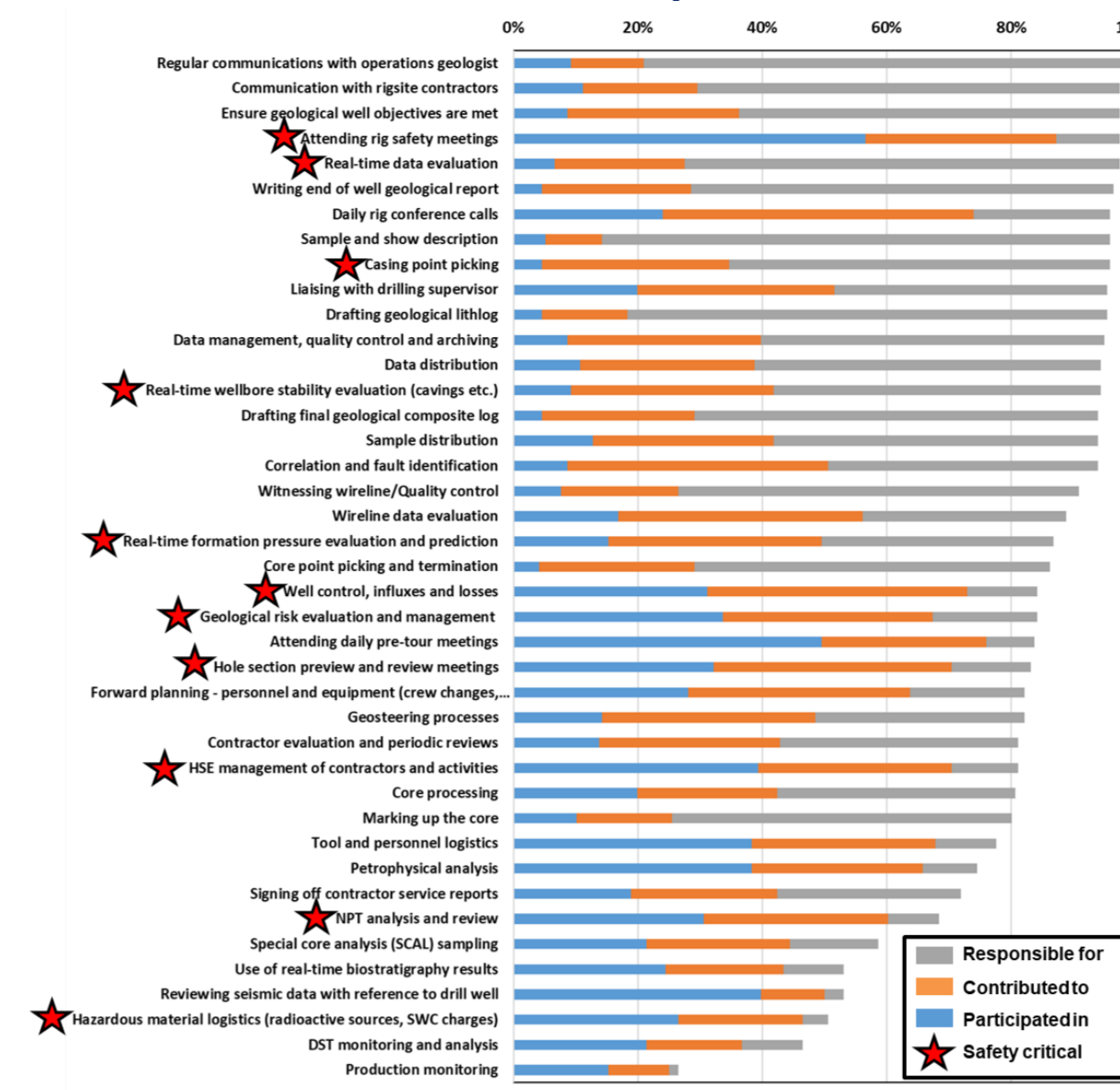
What Do Wellsite Geologists Do?

- We all think we know what wellsite geologists actually do, or think we do. This survey is about:
 - Getting hard data on actual activities and contributions.
 - Using the data to constructively inform operator functions such as SCM etc what the wellsite geologist does.
 - Highlighting the safety critical activities.
- Three well phases were surveyed.
 - Pre-spud activities – The meetings, well familiarisation and general preparation for a well.
 - Execute phase activities – Drilling and evaluation of a well, data collation, distribution and management.
 - Post-well activities – Final well reporting and well close out.
- For each phase common process tasks were chosen.
- Results are for full population of respondents so some may not be involved in some tasks because of their role.
- Safety critical nature of some of these tasks raises obvious questions around training, expertise and whether we are competent enough to perform them.



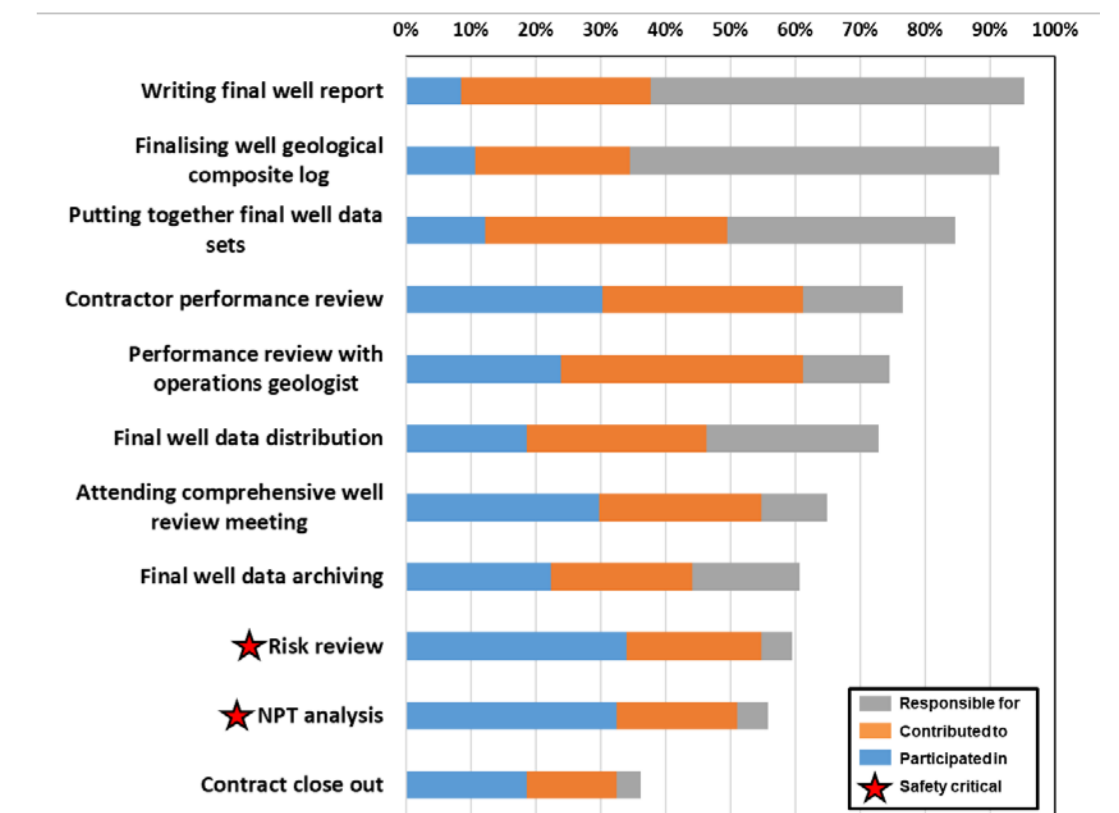
- 55% of respondents at least contributed to pre-well planning phase.

Execution phase activities



- 'Traditional' wellsite geology tasks – no surprises.
- Many are safety critical (marked with star).

Post-well activities

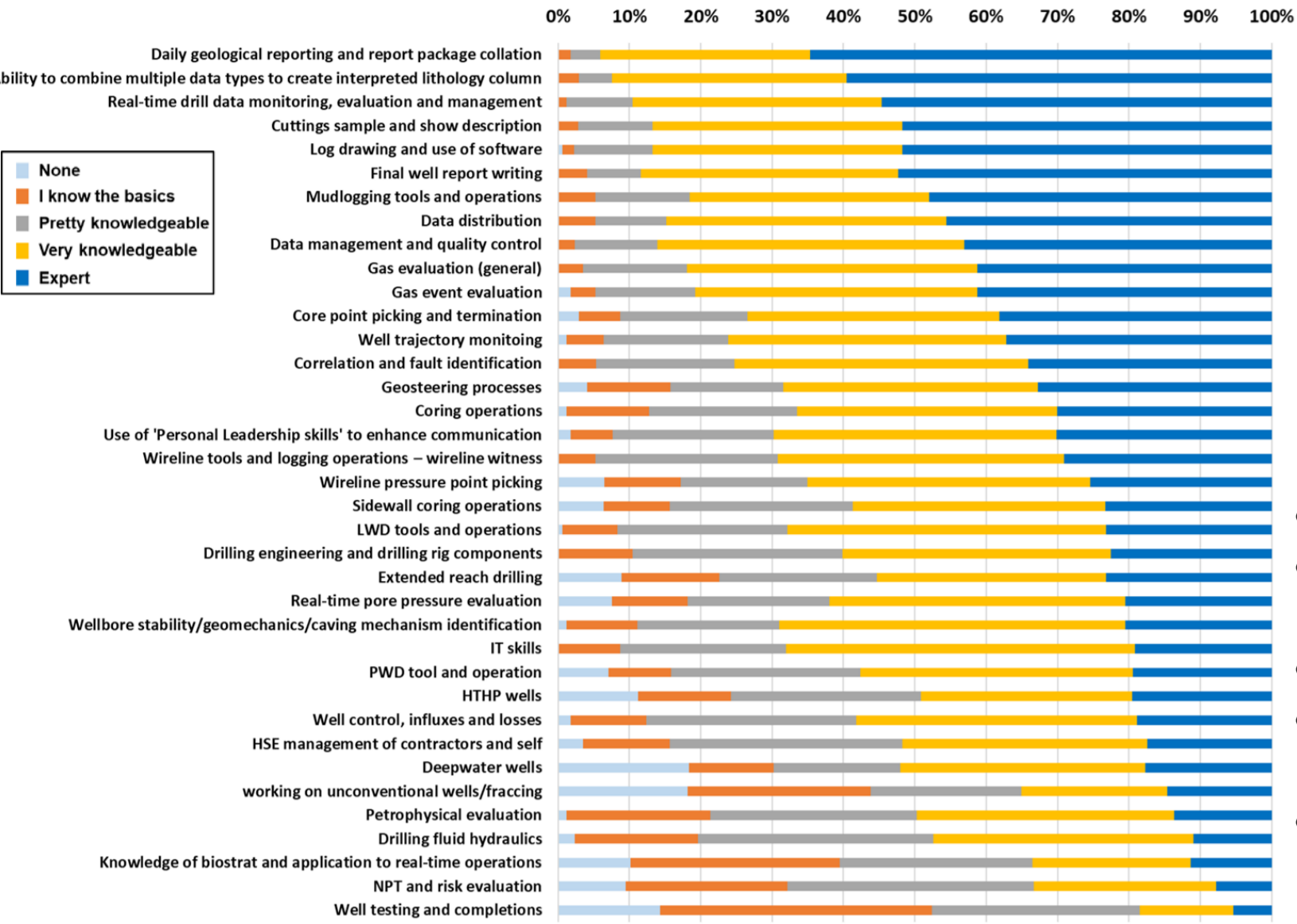


- Over 50% of respondents take part in many post-well activities

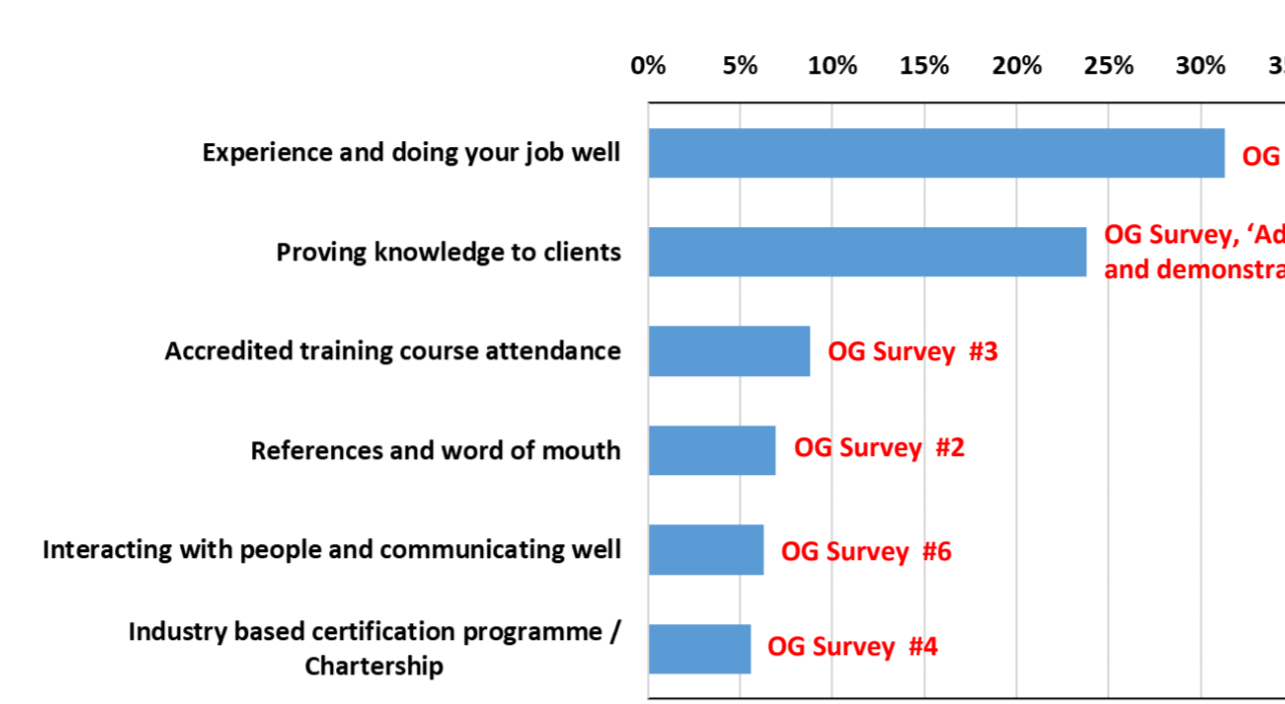
- Results indicate:
 - Activities are pretty much as expected – no surprises.
 - Now have hard data to support what we all knew.
 - Involved in multiple safety critical tasks.
 - Are WSGs trained sufficiently for them?

Expertise and Skillsets

Respondents Proficiencies



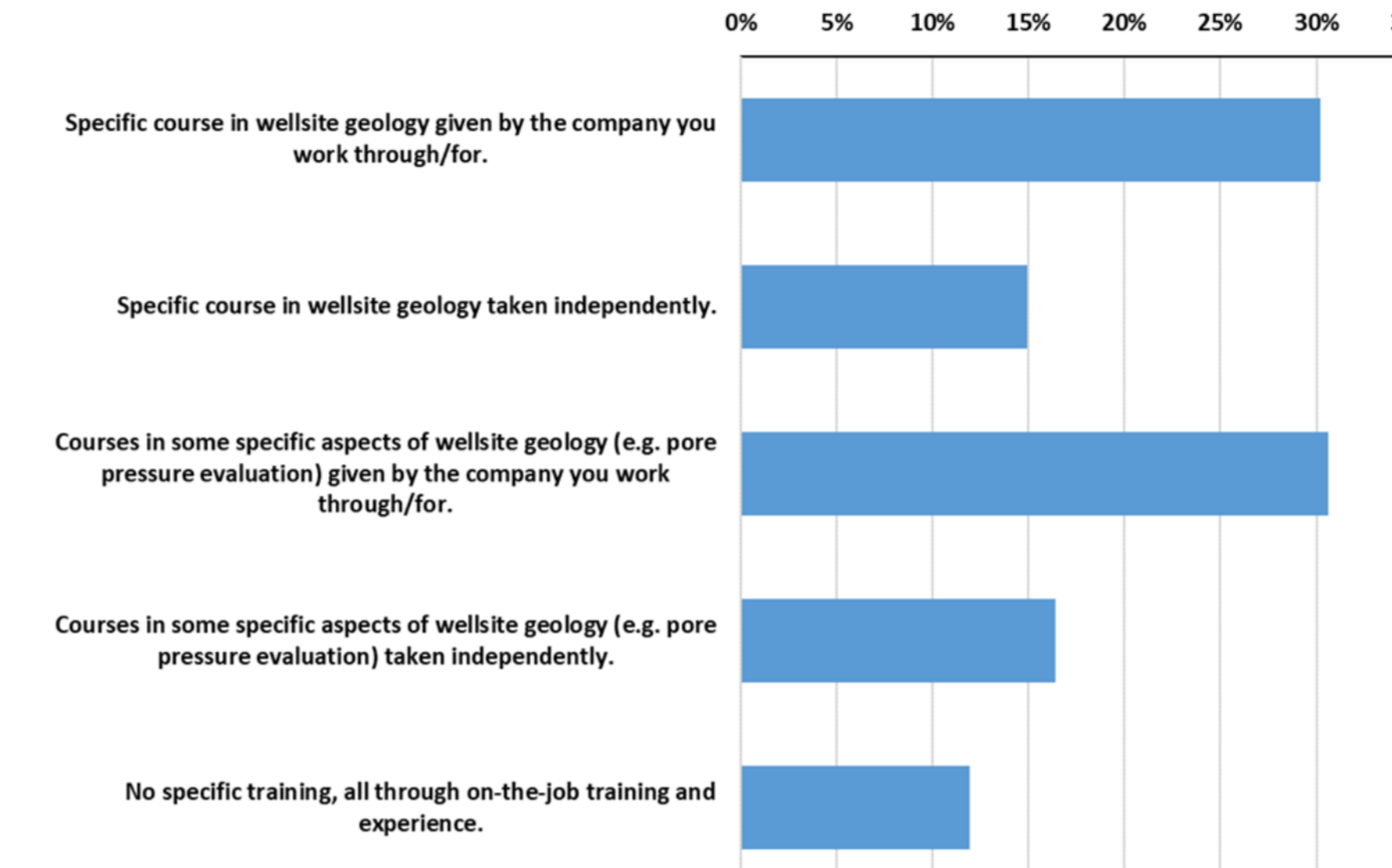
How do you prove competency?



- No real surprises.
- Vast majority are experts or very knowledgeable Really? How do you know?
- How good is the discipline at self-assessing its expertise?
- Only current consensus on proving competency is through job experience and word of mouth.
- Note that list of proving competencies is almost the same as the OG survey.

Training

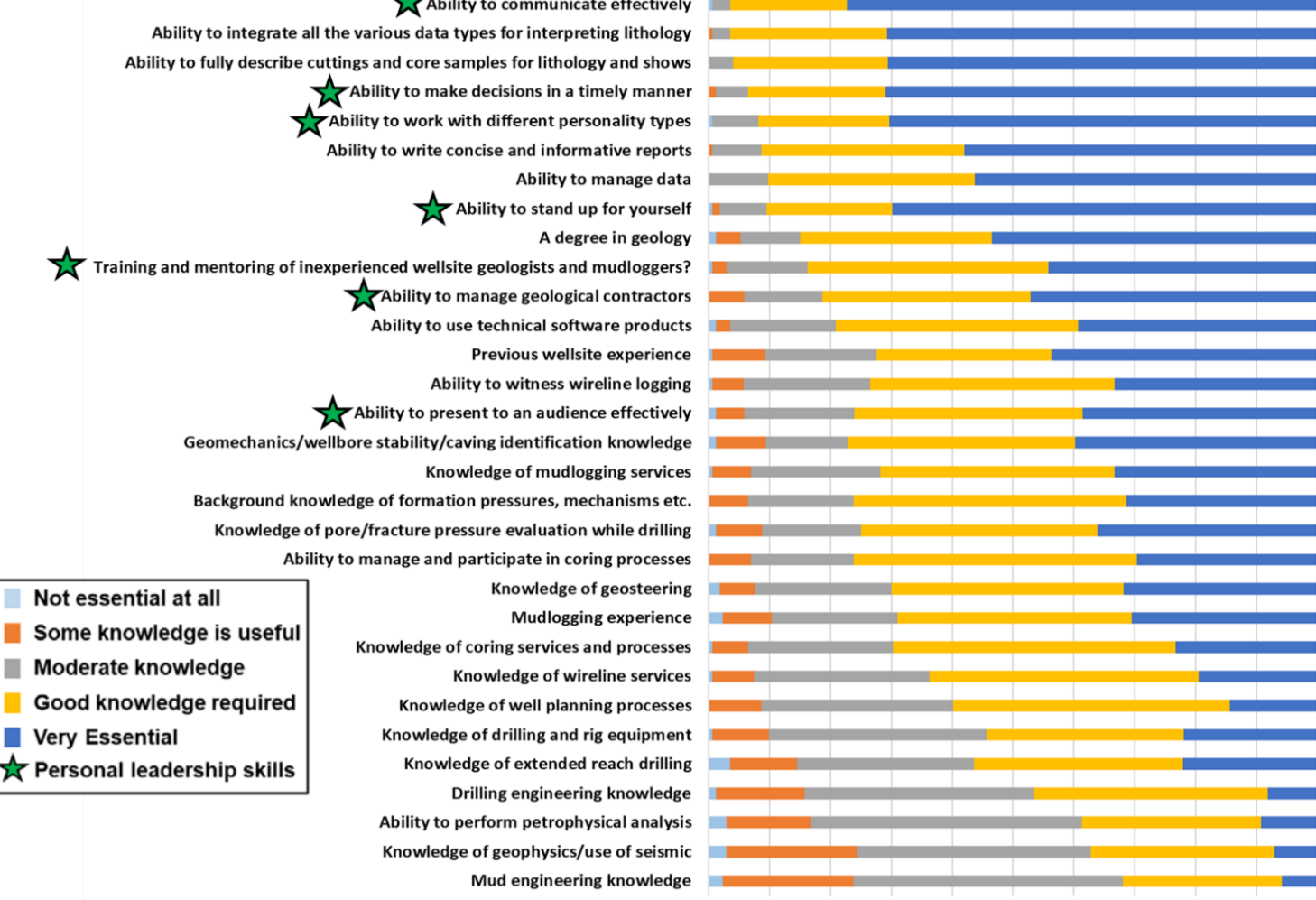
Considering training for your role, did you have:



- 12% had no technical training – all 'on the job'.
- 44% in Australasia had 'on the job training only'.
- PPFG training most requested, log evaluation 2nd.

Essential Skills

On a scale of 1 to 5 (where 1 is not essential and 5 very essential). How essential to wellsite geology is:

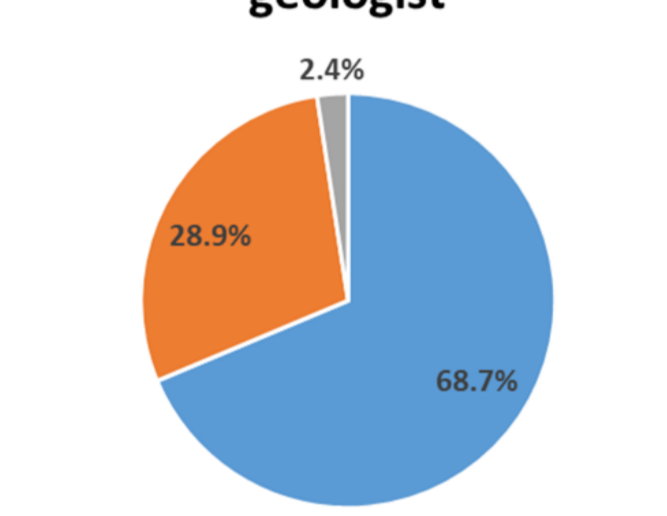


- 3 of top 5, and 7 of top 15 essential skills are 'personal leadership skills' for which we rarely get training.
- Technical skills not as surprising.

Wellsite Geology Autonomy

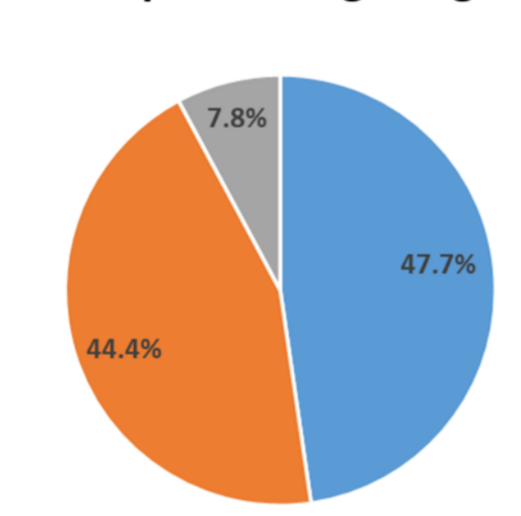
I make all the decisions after discussion with the operations geologist

2.4%



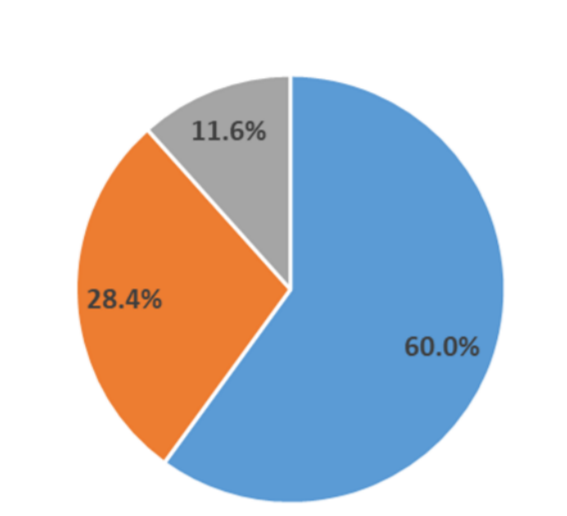
All decisions are made by the operations geologist

7.8%

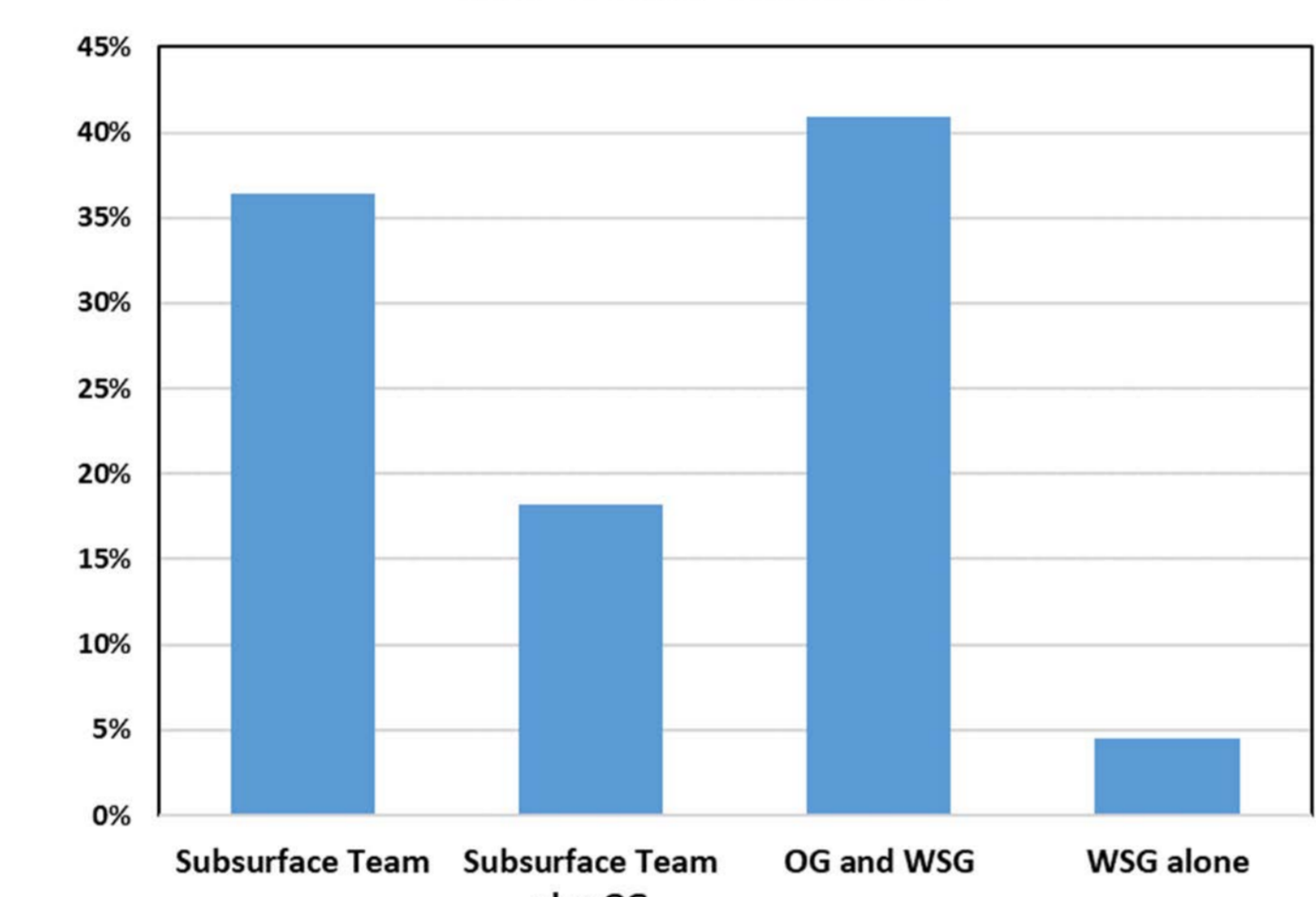


I make fewer decisions now than I used to

11.6%



Who makes decisions?



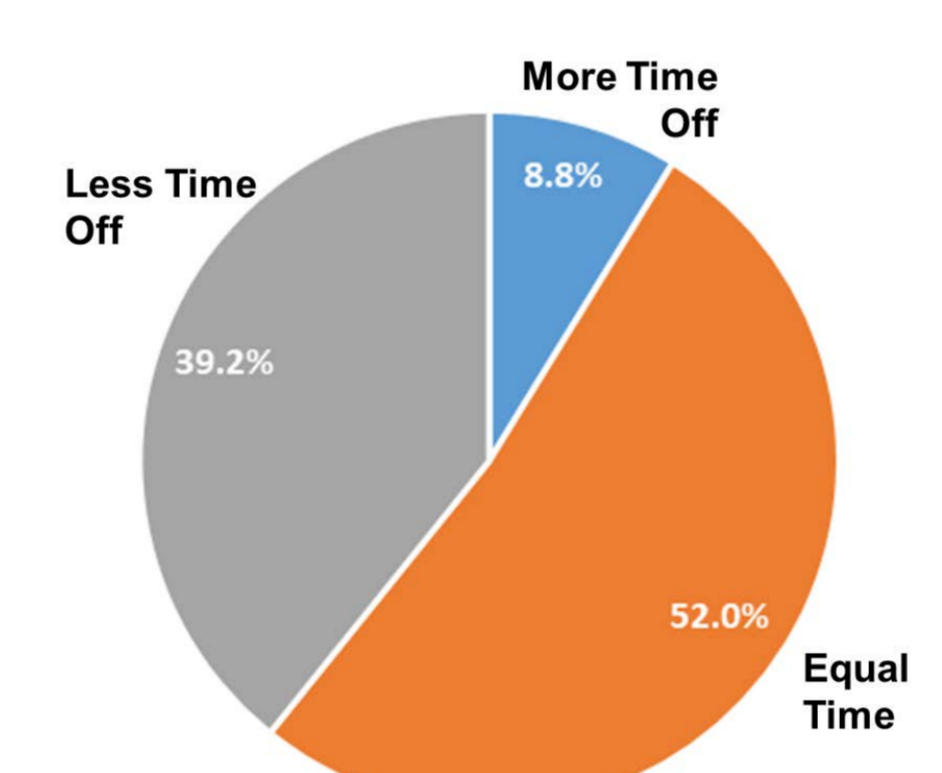
Subsurface team = Asset team, management team, G&G team etc. Will probably also include drilling

- Majority feel there has been a reduction wellsite autonomy.
- Almost 70% of decisions made with support of operations geologist although this has been the case for a long time.
- Modern communication systems facilitate the conversations between rig and office.
- All the information required to make a decision is to hand.
- WSG may not be involved in decision making 50% of time

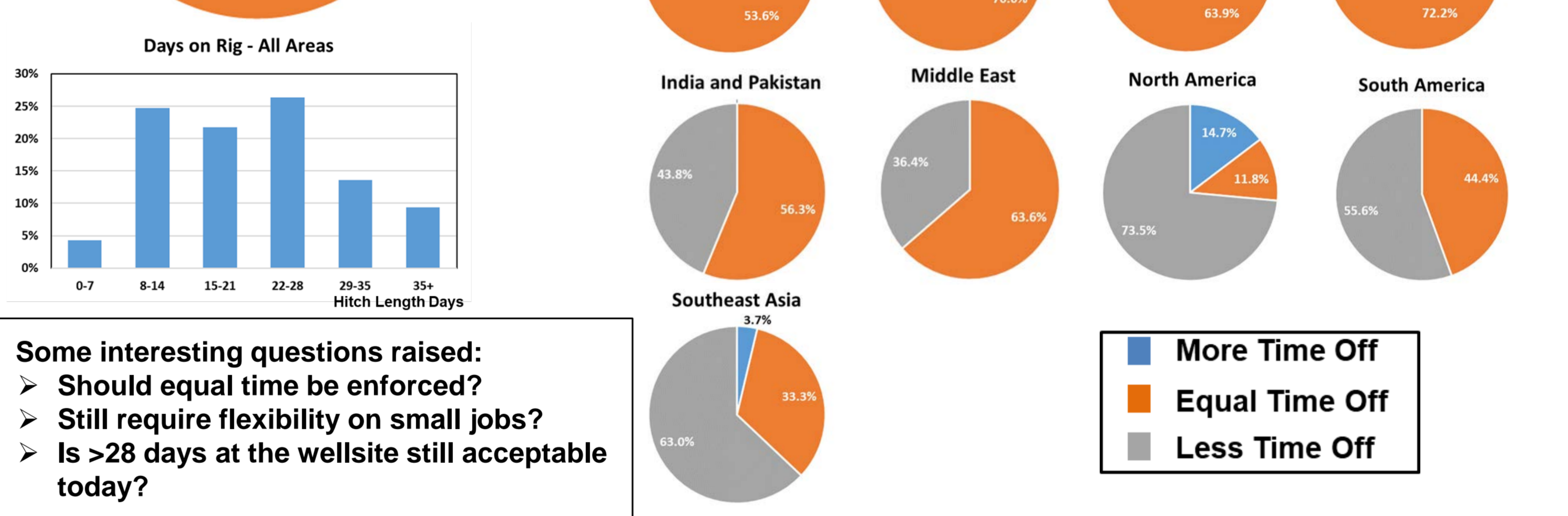
- Difficult to make conclusions on one survey at a moment in time:
 - Has autonomy really changed that much?
 - Haven't important decisions always been in combination with operations geologist?
 - Is subsurface team really having an influence on decision making?

Working Time

Work Time - All Areas Combined



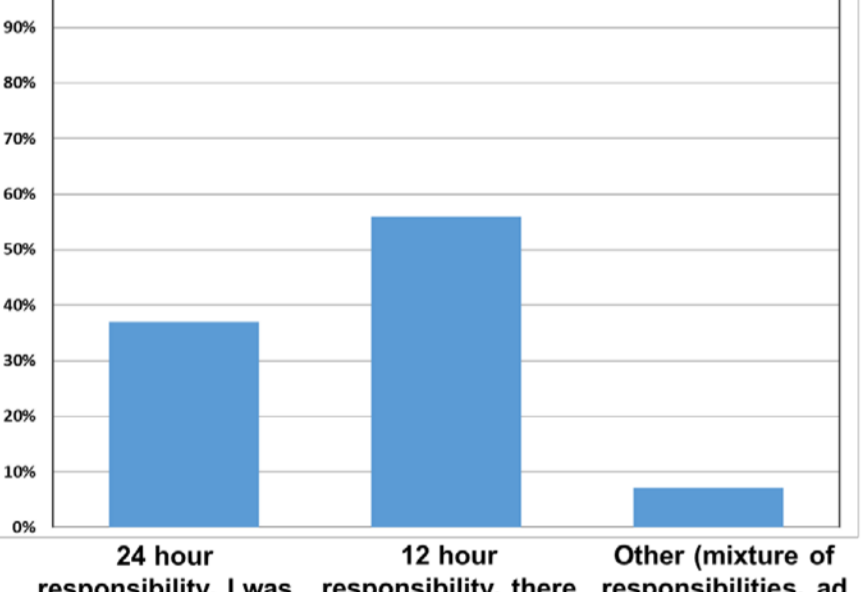
- Worldwide only half of respondents work equal time.
- Some have more time off – e.g. Norway but some are having long time off between wells.
- Nearly 40% work less than equal time – many work ad-hoc hitches or 'the whole well'. North America and SE Asia in particular.
- More than 20% of people work more than 28 day hitches.
- Driven by operators desire to save money? What about HSE of long hitches?



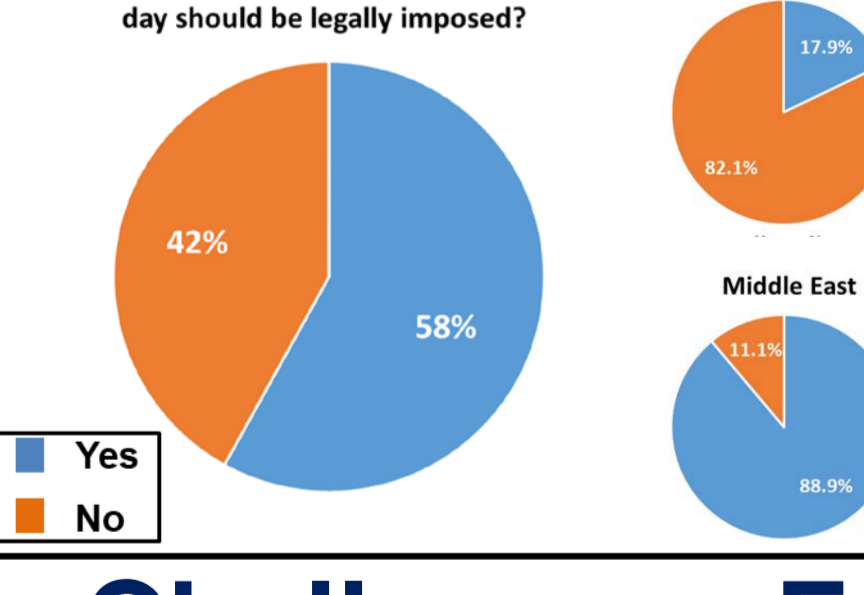
- Some interesting questions raised:
 - Should equal time be enforced?
 - Still require flexibility on small jobs?
 - Is >28 days at the wellsite still acceptable today?

Working Hours – Too many?

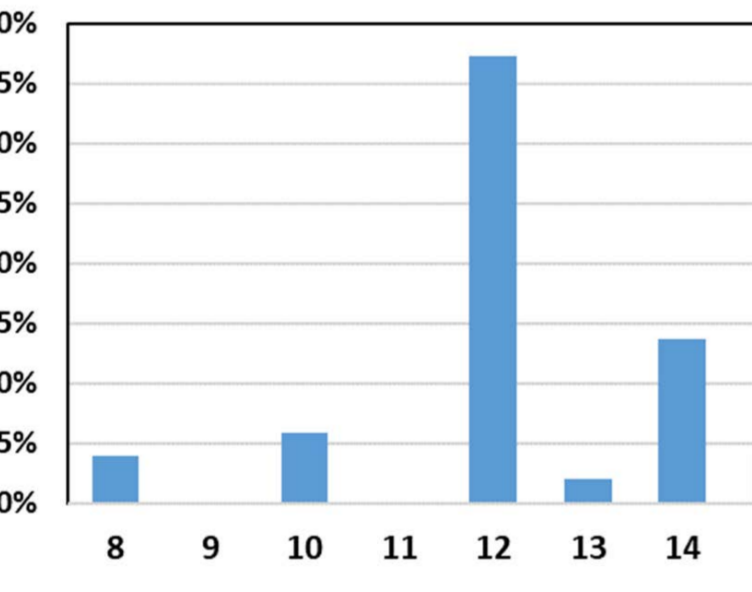
Considering your current/last job, what did you work:



Do you think that a maximum working hours per day should be legally imposed?

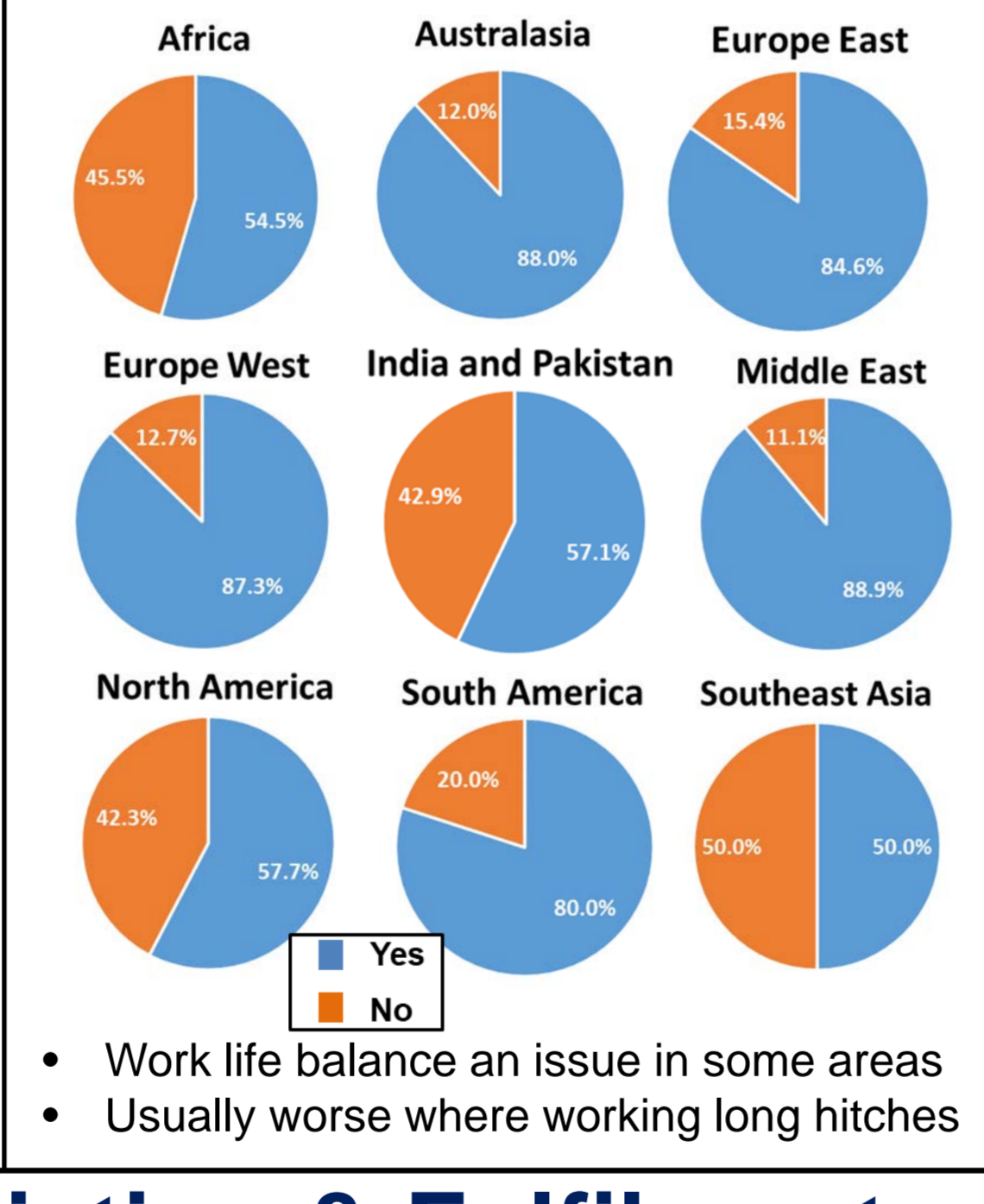


Suggested Maximum Hours



- Shift pattern 12 or 24 hour did not affect maximum legal hours vote.
- North America most against and Middle East most for maximum working hours.
- Only 51 respondents for suggested maximum hours.
- 16 was maximum hours suggested by any respondent.

Work-Life Balance

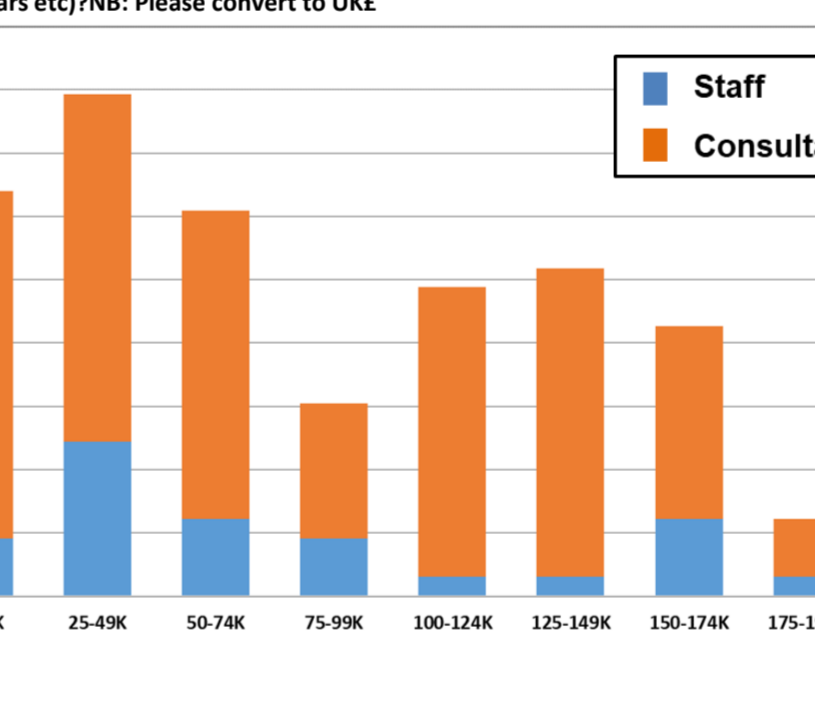


- Work life balance an issue in some areas
- Usually worse where working long hitches

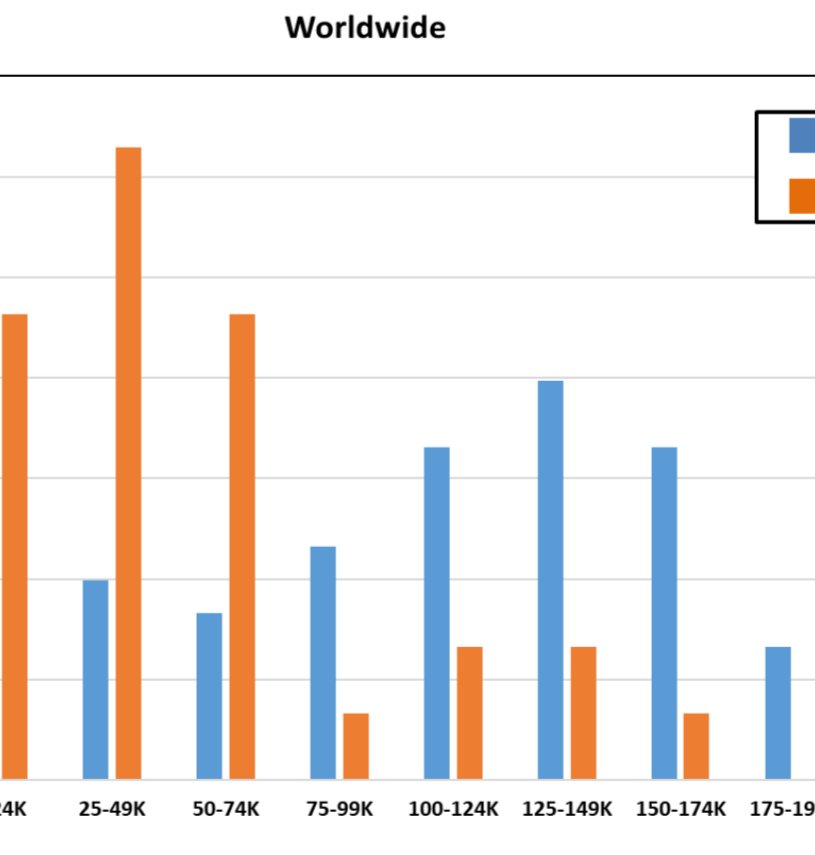
Remuneration

Remuneration – All

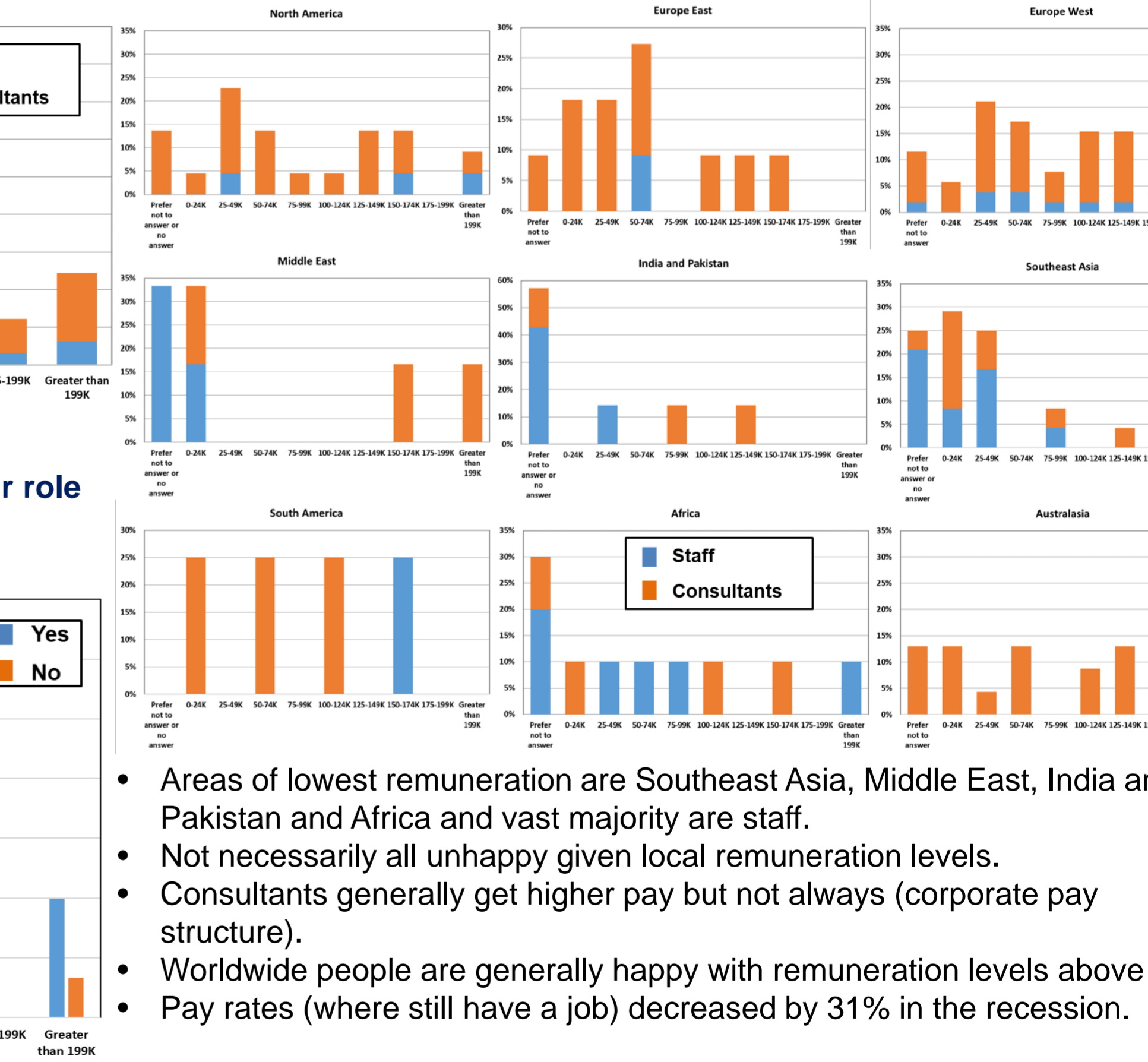
Approximately what was your gross income for the last year you worked (for staff include a good estimate of benefits such as pension, bonuses, training, medical and cars etc)/GBP. Please convert to UK£



Do you feel adequately rewarded in your role as an operational geoscientist?



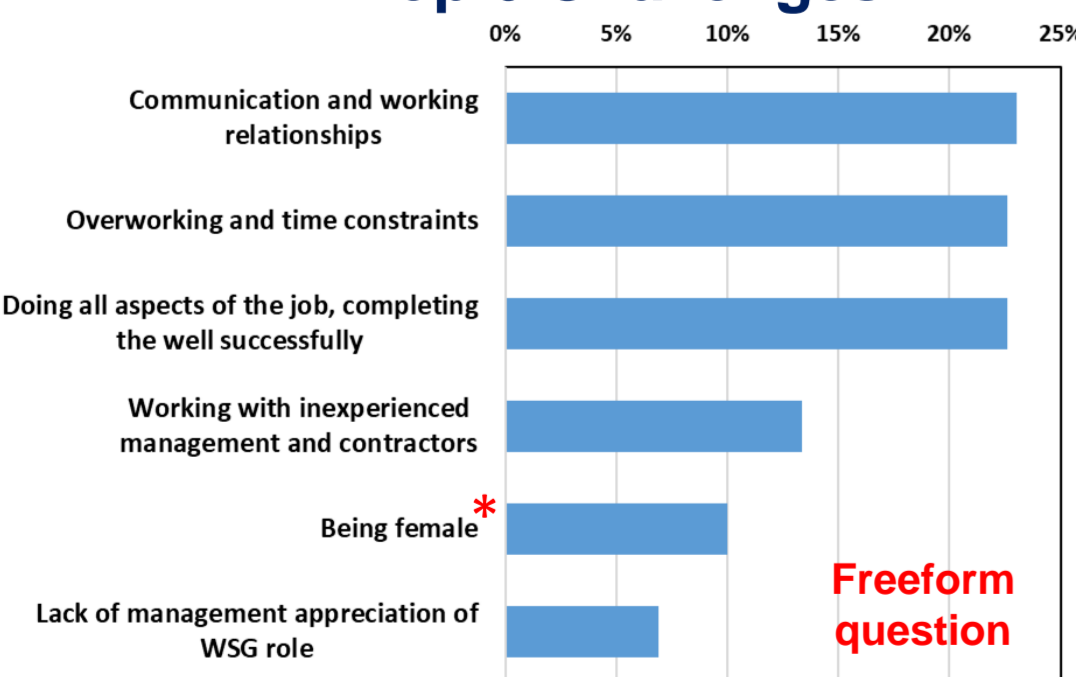
Remuneration – Staff vs Consultants by Region



- Areas of lowest remuneration are Southeast Asia, Middle East, India and Pakistan and Africa and vast majority are staff.
- Not necessarily all unhappy given local remuneration levels.
- Consultants generally get higher pay but not always (corporate pay structure).
- Worldwide people are generally happy with remuneration levels above £75k.
- Pay rates (where still have a job) decreased by 31% in the recession.

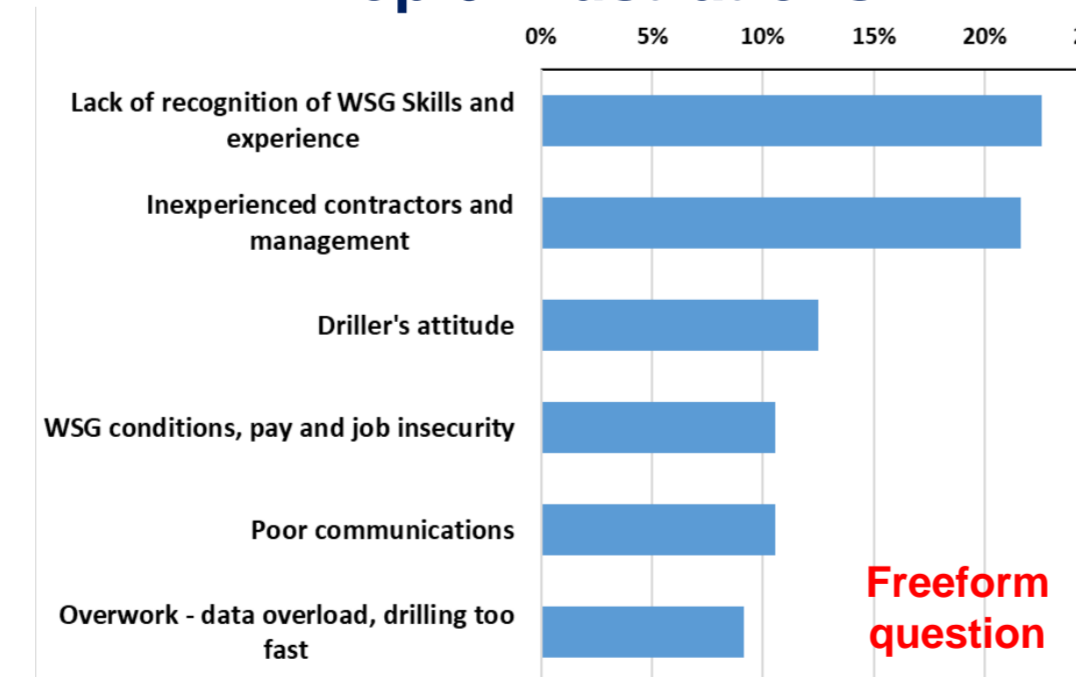
Challenges, Frustrations, Appreciation & Fulfilment

Top 6 Challenges



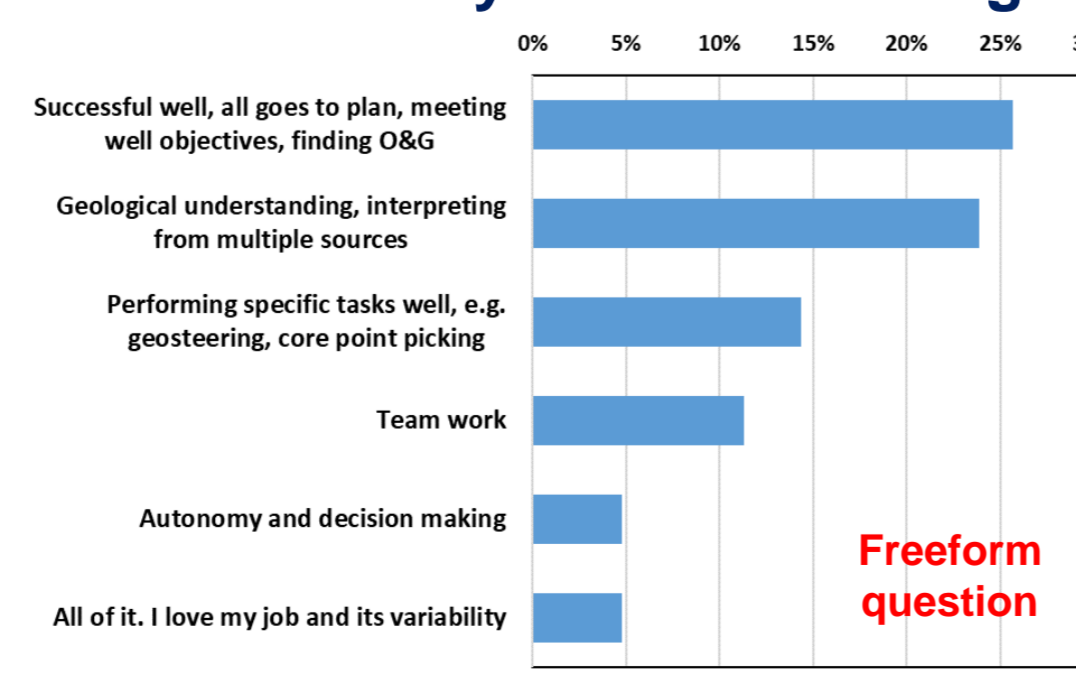
- Communications, overwork and working with inexperienced people are top challenges and frustrations.
- Appreciation levels feel high though.

Top 6 Frustrations



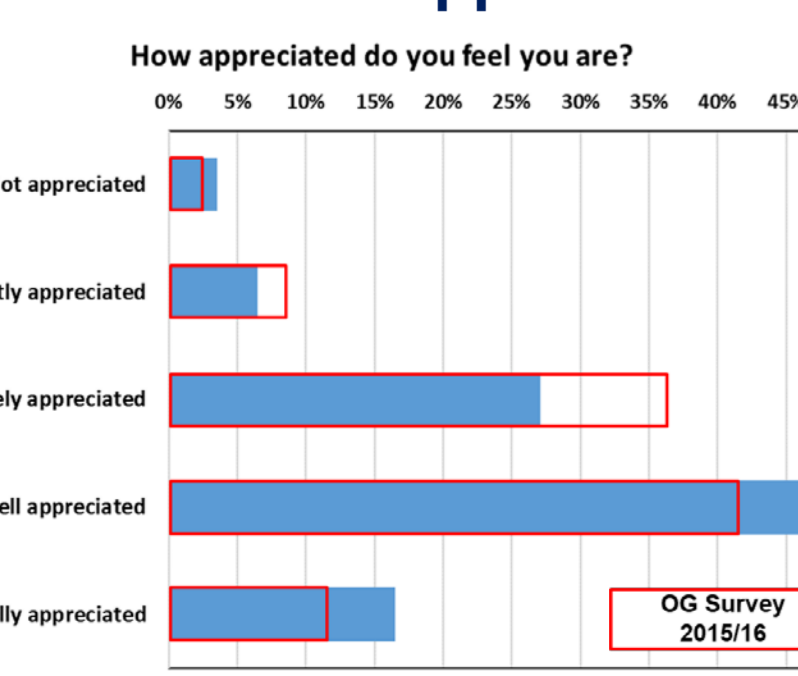
- Lack of recognition of WSG Skills and experience
- Inexperienced contractors and management
- Driller's attitude
- WSG conditions, pay and job insecurity
- Poor communications
- Overwork - data overload, drilling too fast

What do you Find Fulfilling?



- Successful well, all goes to plan, meeting well objectives, finding O&G
- Geological understanding, interpreting from multiple sources
- Performing specific tasks well, e.g. geosteering, core point picking
- Team work
- Autonomy and decision making
- All of it. I love my job and its variability

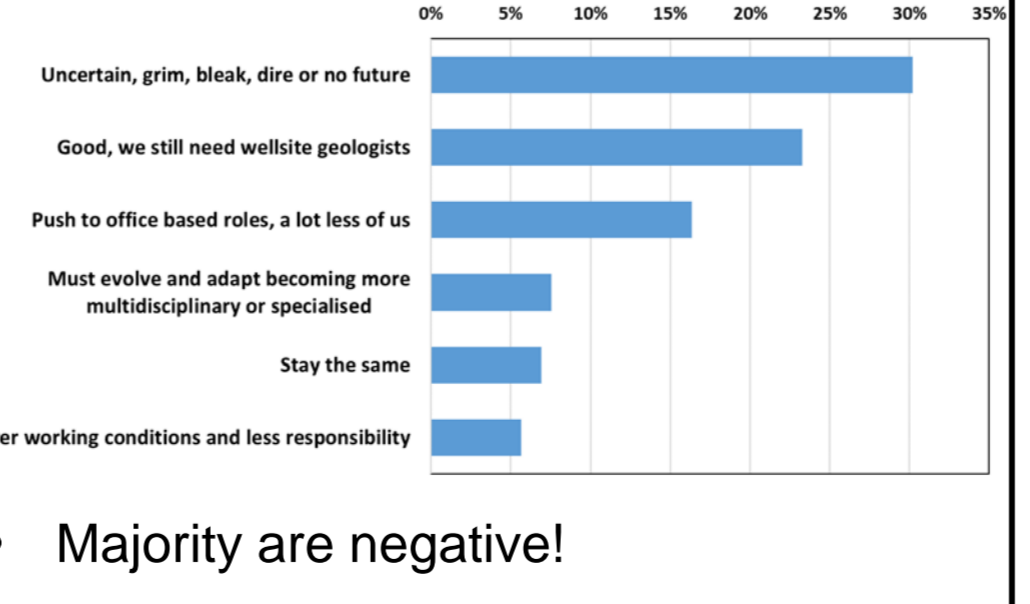
Do You Feel Appreciated?



- 1. Not appreciated
- 2. Slightly appreciated
- 3. Moderately appreciated
- 4. Well appreciated
- 5. Fully appreciated

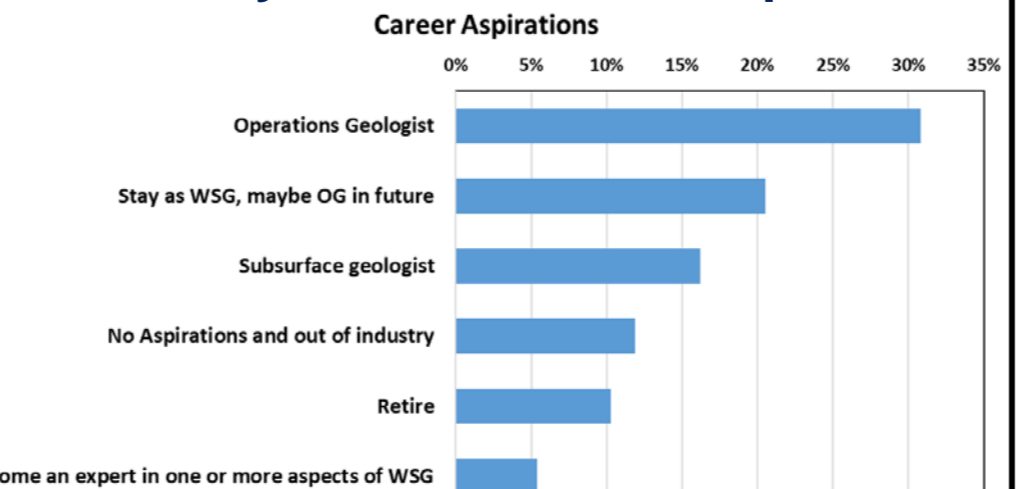
The Future of WSG

How do you see the future?



- Majority are negative!

Where Next? What's your next career step?



Conclusions

- The wellsite geology role is still important but is evolving.
- Generally still working too long hours but OK if managed properly. Can be an HSE issue.
- More effort needs to be made to attract and retain women in this discipline and other disciplines of operational geoscience.
- Mudlogging is still an important rootstock for the discipline, although maybe not as important as it was.
- A degree is geoscience still thought of as important by the vast majority.
- Personal leadership skills, communication etc., are as important as technical abilities but, it is these skills the discipline has the least training for.
- Communications and lack of recognition of the WSG skillset are seen as the two main challenges and frustrations of the role.
- Working with inexperienced people who do not understand the WSG discipline becoming more of a challenge.
- For the most part the discipline is well paid for working hard. However, getting steady work as a consultant is still an issue.
- Those who had work had an average 31% remuneration decrease in the recession. Many had no job.
- There is still a lack of appreciation of what WSGs do in some companies.
- Most WSGs see the future as not very bright. Minority not as pessimistic.