

Progress and Challenges for Health, Environment, and Safety in Exploration and Production

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A computer-based survey was taken of the program committee members of five SPE International Health, Safety, and Environment (HSE) Conferences over the past 5 years.¹ The committee members are experts in their fields and they were asked to express their opinions on the progress of the industry in HSE over the past 5 years and the effort that the industry should make over the next 5 years.

The committee members were asked to complete a web-based questionnaire with the following questions:

1. How would you rate the progress made by the industry in the following subjects over the past 5 years? (excellent, good, moderate, poor, very poor)
2. How would you rate the effort that the industry should make in the next 5 years? (much more effort, more effort, same effort, less effort, much less effort)
3. How would you rate the effort the regulators should make in the next 5 years? (much more effort, more effort, same effort, less effort, much less effort)
4. How would you rate the effort that the nongovernmental organizations (NGOs) should make in the next 5 years? (much more effort, more effort, same effort, less effort, much less effort)

The method of scoring and ranking is summarized in the appendix. A summary of the status of the industry programs is shown in **Table 1** with the full results in **Tables 2–4**. Of the list of 20 questions, 16 were asked at all five conferences

but 4 new questions were asked at the 2008 conference in Nice, France.

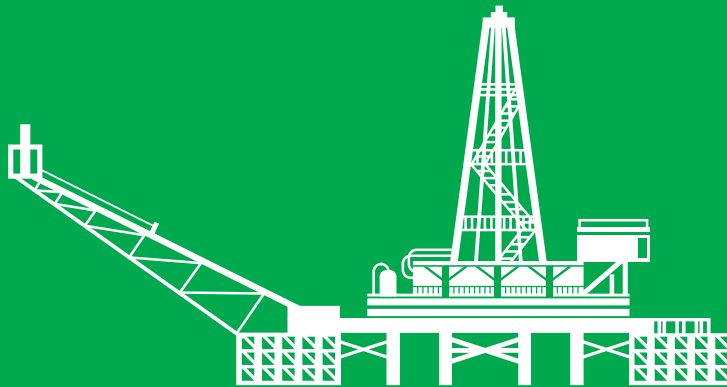
The chart in **Fig. 1** shows the scores for progress from the Nice (2008) conference. The seven issues in the first column of Table 1 are the highest-ranked items in the Progress list based on the results from Nice as shown in Table 2 and have been categorized as “good progress,” while the six issues in the third column of Table 1 are the lowest-ranked issues from the Progress list and have been categorized as “needs more effort.” The issues in the second column are those issues in between the other two categories and have been categorized as “maturing.” The issues in the table are, therefore, in seriatim order for the progress scores and the numbers in the parentheses are the rank for the future effort score.

The graphs in **Figs. 2 and 3** show the changes in survey scores over the past 5 years for eight of the issues. All the scores are included in Table 2. It is interesting to note the relative consistency of scores when we consider that the respondents are from five different conference organizing committees from conferences in four continents. (A few committee members were involved in more than one conference). It is also interesting to note that there are very few clear trends over the 5 years, either in improvement or getting worse. The scores for biodiversity show a gradual upward slope for progress although from a very low score of 20 (moderate to poor). This lack of clear trends seems to indicate that 5 years is not long enough to make a significant impact in the scores for most of the categories but it does indicate a consistent attitude within the industry.

Comments on the Status of Industry Programs

Good Progress. Safety Performance is regarded as having made good progress as has the subcategory of Collaboration with Contractors to Improve Safety Performance. In fact, both progress and future effort scores have been near the top of the list for many years. This attitude is consistent with the actual performance of the industry when we consider that the lost-time injury rate for safety has decreased by 40% over the past 5 years and it has decreased by an impressive factor of three over 10 years. In particular, the global survey of the International Association of Oil and Gas Producers (OGP) shows that contractor safety performance has made great progress in closing the gap with company employee safety performance. Approximately 70% of the oilfield labor force is contracted so it is very important for the operator and the contractor to coordinate their HSE management systems. There was concern at

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TABLE 1—SUMMARY OF THE PROGRESS OF INDUSTRY PROGRAMS IN HSE. THE NUMBERS IN THE PARENTHESES ARE THE RANK FOR FUTURE EFFORT

Good Progress	Maturing	Needs More Effort
Environmental impact assessments (20)	Programs to prevent disease (12)	Health management (2)
Safety performance (9)	Development of international standards (17)	Sustainable development principles (13)
Environmental performance (4)	Operating in sensitive ecosystems (7)	Implementation of biodiversity programs (18)
Management systems (19)	Social responsibility (14)	Programs to reduce greenhouse gas emissions (3)
Training employees (11)	Asset integrity (8)	Occupational health (5)
Reporting HSE performance (16)	Application of technology (10)	Carbon capture (6)
Contractor safety (1)	Engagement of stakeholders (15)	

the Nice conference about the current aging work force and the “big crew change,” which will require continued diligence in training and in maintaining a safety culture.

The Implementation of HSE Management Systems has been an item of much attention for every SPE international conference since the first one in The Hague in 1991 and significant progress has been made. The management system of the OGP was introduced in 1994 and has been used as a guide for many companies. Some companies (ExxonMobil and Chevron) have titled their management systems “Operational Excellence” to include a wider range of issues than just HSE to ensure that the operations are safe, reliable, efficient, and environmentally sound. A more recent report from OGP on “Environmental-Social-Health Risk and Impact Management

Process” (e-SHRIMP) is a guide to assess and manage oil and gas projects throughout the full field-development life cycle.

It is interesting to observe that Environmental Impact Assessments, Management Systems, Reporting HSE Performance, and Engagement and Training of Employees were ranked high in the Progress list but low in the Future Effort list. However, a score in the 50s for future effort means between “same effort” and “more effort.” This is interpreted to mean that these issues are still important and their implementation should not backslide but their maturity is such that there are additional issues that require increased attention from their historic baseline activity.

With regard to Reporting of HSE Performance, the collection of global statistics for safety is quite mature and the

TABLE 2—NORMALIZED SCORES FOR PROGRESS AND FUTURE EFFORT FOR THE INDUSTRY

Issue	Progress					Future Effort				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
Incorporation of environmental impact statements in development projects	57	57	59	60	61	56	63	53	52	52
Improvement in safety performance	55	56	62	54	60	59	61	60	58	63
Improvement in environmental performance	52	51	56	52	59	64	65	62	71	68
Implementation of HSE management systems	67	57	64	57	57	48	53	49	45	53
Engagement and training of employees to promote HSE excellence	48	68	58	57	54	65	58	63	58	61
Reporting HSE performance	50	63	61	62	52	63	61	57	57	57
Collaboration with contractors on improved safety performance	48	55	56	58	51	71	77	69	70	70
Implementation of programs to prevent disease					51					61
Development and implementation of international standards and guidelines for management systems	43	51	54	51	50	50	59	52	55	55
Management of operations in sensitive ecosystems	48	46	47	46	50	61	68	70	64	66
Implementation of social responsibility programs including partnerships	40	43	42	48	47	63	71	63	59	59
Implementation of programs for asset integrity					47					65
Application of technology to improve HSE performance	44	49	46	42	46	50	70	66	63	63
Engagement of stakeholders	49	57	53	54	45	66	60	70	60	59
Improvement in health performance	43	39	35	40	45	66	71	79	71	69
Implementation of sustainable development concepts	28	39	38	43	38	62	69	62	68	60
Implementation of biodiversity programs	23	24	32	34	37	57	61	62	58	55
Implementation of programs to reduce greenhouse gases	32	27	32	32	34	65	69	72	76	69
Implementation of programs to improve occupational health										31
Implementation of programs for carbon capture										25
Number of respondents	26	28	52	49	92	26	28	52	49	92



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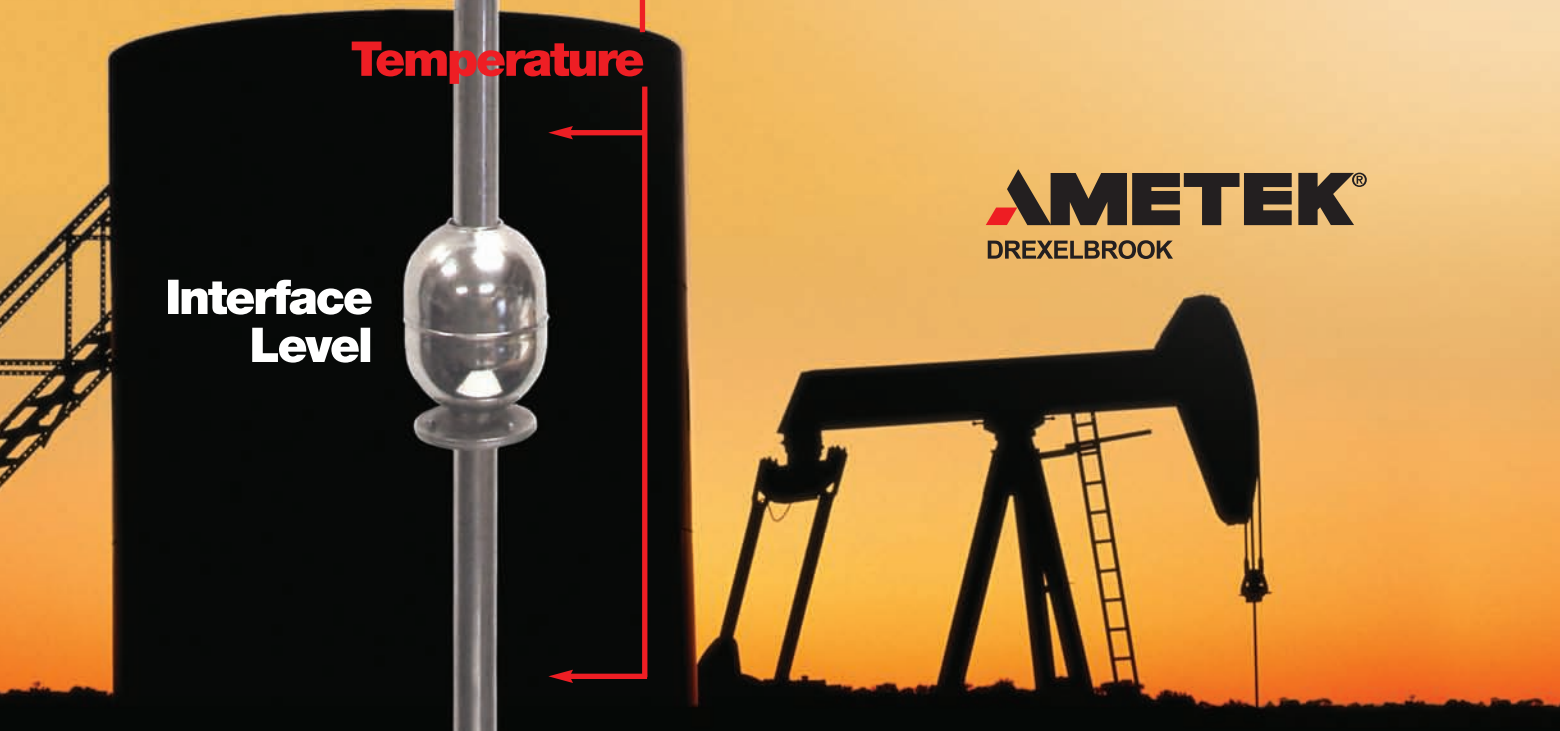
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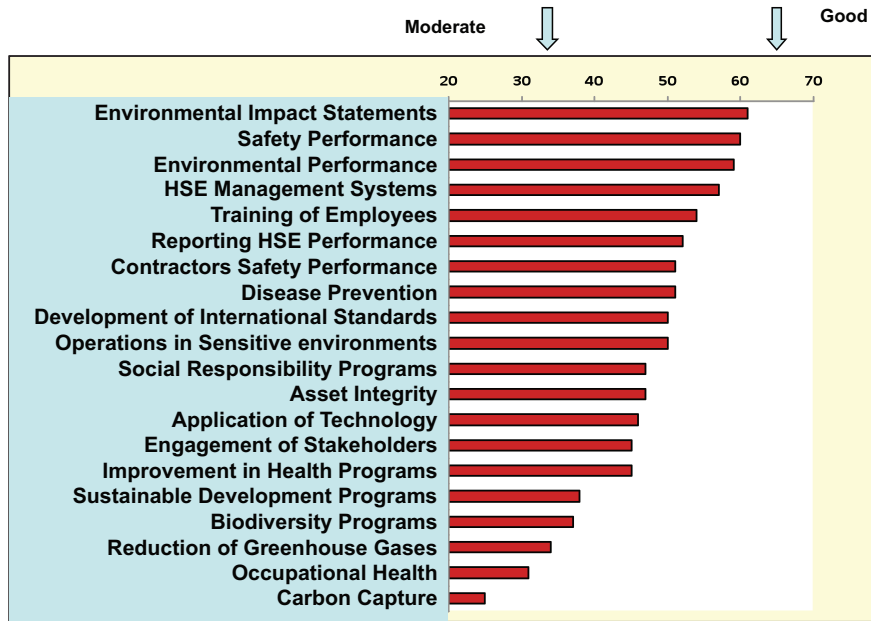


Fig. 1—Scores for industry progress over the past 5 years.

collection of global statistics for environmental performance is making good progress. However, the reporting of global health statistics has a long way to go. Incidents of oil spills have been published by ITOPF for many years and individual companies have published their own environmental reports. The OGP report on Global Environmental Performance is now in its 5th year and is a major step forward in the challenge of collecting credible global environmental statistics.

The IPIECA report on guidelines for sustainability reporting includes HSE issues along with social issues.

Environmental Performance and Environmental Impact Assessments were given high scores. The industry is making steady progress in discharge and emission control as shown in the OGP annual report. Continued efforts are needed to develop lower toxicity chemicals, the so-called “green” chemicals.

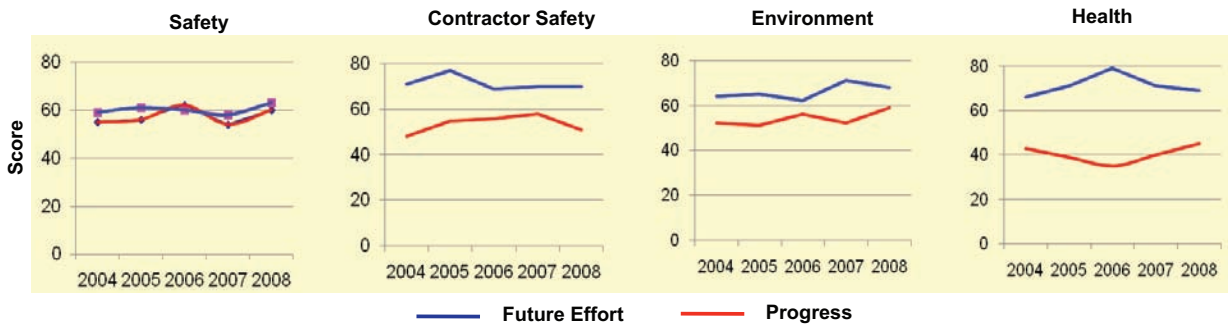


Fig. 2—In core HSE categories, scores have been generally consistent over 5 years. Contractor Safety has good progress and still a high interest for future effort. Health exhibits low progress but high interest for improvement.

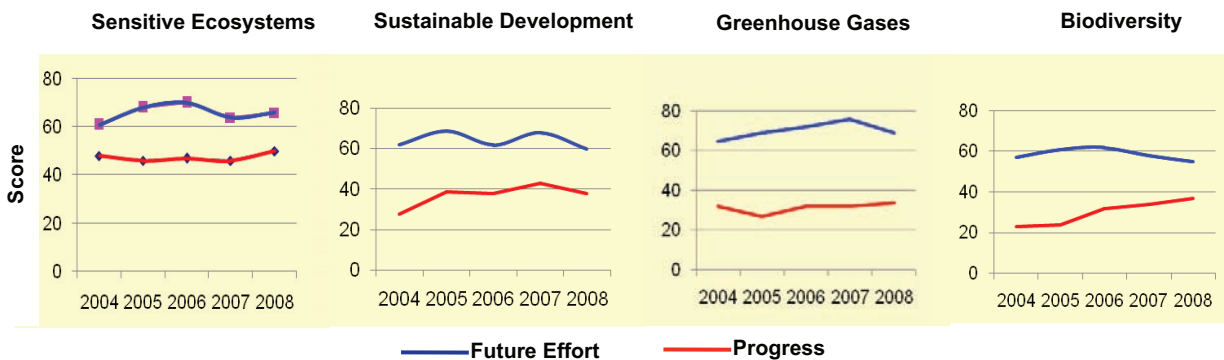






Fig. 3—Overall scores in several areas with moderate progress in biodiversity.



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TABLE 3—NORMALIZED SCORES FOR FUTURE EFFORT NEEDED FROM REGULATORS

Issue	2004	2005	2006	2007	2008
Ensure that regulations are based on good science.	74	77	75	76	70
Cooperate with industry to help combat corruption.	68	70	75	73	71
Ensure good communication and transparency of regulatory activities.	68	70	75	75	64
Cooperate with stakeholders to create a balance between prescriptive regulations and performance-based regulations.	71	69	70	72	67
Ensure equitable enforcement within borders and consistency across borders.	70	69	73	71	60
Coordinate with other international regulatory bodies to facilitate development of international standards.	64	73	67	72	65
Timely decisions on project approval requests.	67	61	70	69	68
Encourage market mechanisms and new technology.	61	66	64	60	62

Needs More Effort. There is a low score for progress in the general category of Health Performance as well as the category of Occupational Health that includes stress management. The score for Programs to Prevent Disease is a little better, which demonstrates that some parts of the industries' health programs are doing better than others but overall the progress is not as good as in the safety and environmental issues. To bring more focus to health programs, the OGP produced a report titled *Strategic Health Management* in 2000 and OGP/IPIECA produced a report titled *A Guide to Health Impact Assessments* in 2005 but attempts to produce a global metrics report are still in process.

There was considerable discussion at the Nice conference on Greenhouse Gas Reduction and Carbon Capture. For the past 5 years, the score for progress on greenhouse gas emissions has been low although the topic has consistently scored very high on the need for more effort in the future. Capture and storage of carbon dioxide was given a low score on progress but a high score on future effort. Speakers at the conference recognized that the oil and gas industry has the expertise to manage underground storage and containment of carbon dioxide so we can expect to see much larger activity over the next 5 years. There is a need to develop alliances with other industries such as power generation because capture of carbon dioxide is a major cost item.

Implementations of Programs for Biodiversity scored in the low category for progress (18th) although Operations in Sensitive Environments scored in the middle category (7th). This is a little inconsistent and may be interpreted as recognition that the industry is performing responsibly for specific operations in sensitive areas but the deeper meaning of biodiversity and its importance needs more communication. The Energy Biodiversity Initiative is an excellent step in the right direction. There was considerable interest at the Nice conference on the impact of seismic waves on marine mammals.

Social Responsibility programs and Engagement of Stakeholders were given scores in the middle category for progress and for future development. Partnerships, stakeholder dialogue, anticorruption programs and transparency are making reasonable progress and are regarded as important challenges for the future. The OGP/IPIECA report on *Key Questions in Managing Social Issues in Oil and Gas Projects* presents a very good guide for managing such programs.

Also given a low score for progress and a mid-list score for future development was the Implementation of Sustainability

Concepts. Sustainable development is broadly defined as seeking the appropriate balance among economic, social, and environmental goals. This balance may differ among societies depending on their current status of development. For example, developed societies are using more of their economic capital to rebuild environmental capital while developing societies may be using more environmental capital to build their economic and social capital. All of the items in the questionnaire have some impact on sustainable development so the low score for the general category is interpreted as a lack of a clear definition within the industry of the meaning of the term. Development of a single sustainable development index is a major challenge.

The question concerning Asset Integrity was asked for the first time in Nice recognizing this issue as one of growing importance. The progress score was in the middle category as was the future effort score. The current high oil price is leading to an extension of the working life of many fields and the integrity of aging equipment will need constant attention to prevent accidents and environmental impact.

The two issues of Development and Implementation of International Standards and Application of Technology to Improve HSE Performance are long time objectives of the industry and were given mid-level scores for progress.

Regulators

The respondents were mostly from industry so the results in Table 3 offer some clear insights as to what the industry expects from the regulators over the next 5 years. The scores have been consistent over the past 5 years.

1. Regulations should be based on good science and it is an obligation for industry to cooperate with governments to conduct the necessary research to provide that science.

2. There is a need for governments to cooperate with stakeholders to create a balance between prescriptive regulations and performance-based regulations and to be consistent with sustainable development concepts. An excellent example of a performance-based regulatory system is the safety case system in the UK North Sea. In this example, the operator and the regulator agree on the required level of performance for reducing risk and the operator then decides how to achieve that performance goal. Risk-based and performance-based systems are a challenge for regulators because the decision on whether an operator is in compliance requires a degree of

TABLE 4—NORMALIZED SCORES ON THE QUESTION OF FUTURE EFFORT NEEDED BY NGOs

Issue	2004	2005	2006	2007	2008
Help society determine the appropriate balance between economic, social, and environmental considerations.	64	65	70	71	64
Contribute to constructive dialogue with other stakeholders.	67	66	69	70	64
Help industry and government communicate with the public to improve awareness of all sides of the issues.	61	66	71	71	61
Cooperate with industry and governments to collect data and prepare accurate HSE and social impact assessments.	61	66	64	71	59
Coordinate with other NGOs to promote consistency, sharing of best practices, and transparency.	61	68	67	65	60
Enter into partnerships with industry.	55	63	65	63	63

judgment that, in turn, requires a high degree of training on the part of the regulators.

3. There is a need in the international regulatory community for consistency of regulations across international boundaries, equitable enforcement, and more transparency. These objectives will help the anticorruption objectives of the industry. Many of the world's major oil and gas producing countries are ranked very high in the corruption index developed by the NGO called Transparency International.

NGOs

The results from the five conferences shown in Table 4 were generally consistent and called for more coordination among NGOs to contribute toward constructive dialogue with the public and to ensure that accurate data are supplied. This includes environmental and social assessments and cooperation with all stakeholders in determining the appropriate balance among the economic, social, and environmental aspects of sustainable development.

Summary

Since the first HSE conference in 1991, the industry HSE leadership has asked the organizing committees: "What is working and what needs more attention?" The responses for the first 10 years were open ended and it was difficult to form a clear consensus of priorities but the list of topics was fairly consistent from year to year. Starting in Calgary in 2004 and for the following 5 years, a computer-based survey was conducted with the same questions each time which enabled a numeric score to be obtained for each topic.

The overall consistency of the scores in all categories over 5 years and five different organizing committees demonstrates a fairly consistent attitude within the industry. There has been good progress on safety and many of the environmental programs. More effort is needed on health programs, carbon capture, and biodiversity. It is recommended that the questionnaire should be completed by future biennial international conference organizing committees to complement actual performance metrics. The next international meeting is in Rio de Janeiro in 2010.

Reference

1. Past SPE Conferences involved in the survey:
 - a. The 7th International Conference on HSE in Oil and Gas Exploration and Production, Calgary March 29–31, 2004.

TABLE 5—RANKING METHODOLOGY

Progress	Future Effort	Individual Score	Normalized Score
Excellent	Much more effort	3	100
Good	More effort	2	67
Moderate	Same effort	1	33
Poor	Less effort	0	0
Very Poor	Much less effort	-1	-33

- b. The 1st Asia Pacific Conference on HSE in Oil and Gas Exploration and Production, Kuala Lumpur September 19–21 2005.
- c. The 8th International Conference on HSE in Oil and Gas Exploration and Production, Abu Dhabi, April 2–4, 2006.
- d. The 2nd Asia Pacific Conference on HSE in Oil and Gas Exploration and Production, Bangkok, September 10–12, 2007
- e. The 9th International Conference on HSE in Oil and Gas Exploration and Production, Nice, France, April 15–17, 2008.

Appendix

Description of committee members (Nice)

Total responses 92

Committee Base		Employment Affiliation	
Health	13%	Operating Company	58%
Environment	27%	Contractor/Consultant	35%
Safety/Security	39%	Academia	0%
HSE Management	11%	NGO	0%
Executive	16%	Government	6%

Scoring Methodology

To create a list in seriatim, the responses were given the individual scores shown in **Table 5** and the total score was normalized to make the maximum score equal to 100. For example, if all 28 respondents from a typical survey marked excellent on a question relating to Progress, the total score would be $28 \times 3 = 84$ and this was then set to 100 by multiplying by $100/84$ or 1.19. If 10 respondents marked excellent, 10 marked good and 8 marked moderate on a question, the total score would be $(10 \times 3) + (10 \times 2) + (8 \times 1) \times 1.19$ or 69. A normalized group score of, say 55, indicates that progress on that issue has been graded between moderate and good. It is recognized that this is not a rigorous indicator of a respondent's opinion between excellent and good but it allows a simple means to quantify the replies in order of priority and over different surveys.

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