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Matching mining and geoscience focussed education with industry needs and demand: Lessons from INTRAW's reference countries.

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The Horizon 2020 funded INTRAW project was initiated in 2015, with the objective of establishing the European Union's International Observatory for Raw Materials by 2018. An important element of this was an assessment of the role and importance of mining and geoscience education in reference countries, most of which have major mining industries (Australia, Canada, Japan, South Africa and the United States). These countries have well developed mining education programmes with world class universities and training provision supporting the industry but each face different challenges.

During the recent commodity boom local, national and international skills shortages occurred particularly in mining related professional and technical staff. This was exacerbated by the aging population of global mining professionals and a pronounced demographic gap caused by a lack of mining recruitment during the 1980's and 90's. Academic staff in mining schools exhibit a similar age profile and action is required to ensure the human resources needed to train the next generation of mining professionals. Canadian industry demographics are a major driver of both continued high training need and international recruitment just to replace the retiring industry and academic staff.

There is also a lack of alignment over research and course content in many mining schools as global university rankings drive research metrics that reward blue skies research rather than industry related and applied research. This has caused staff and curricula to focus on fundamental science rather than industry specific knowledge and priorities.

The supply of mining apprentices and graduates is also typically misaligned to industry demands due to the lag time between recruitment and graduation, and how this relates to the long term cyclicality within the mining sector. Student recruitment booms near the peak of industry demand while the resultant apprentices and graduates enter the job market as the downturn is underway. Australia is experiencing a major re-adjustment with the loss of highly paid mining jobs fuelled by the skills shortages during the last boom, and the need to re-establish its international competitiveness; but is experiencing a collapse in mining student and trainee recruitment.

Despite the recent reduction in demand for mining graduates, shortages are still present on a national and local scale due to the growth in resource nationalism. Producer governments seek to ensure maximum employment of national staff and the reduced use of expatriate staff combined with local educational and training levels has created significant shortages. By contrast countries such as South Africa produce sufficient local graduates but lose them to other mining countries in an on-going mining

brain drain. Japan represents a significant contrast in that its policies for raw material supply focus more on bi- and multi-lateral trade arrangements, international partnerships, overseas company ownership, recycling and stockpiling, creating a completely different demand for commercial and business specialists rather than mining expertise.

The major issue is therefore how to maintain mining education and training through the mining cycle, to create careers in the mining industry that are flexible or sustainable through the cycles and have workforce planning that can accurately predict the supply and demand needs, thus avoiding the excessive staff costs seen in the recent years that have created a major cost issue for the industry in many of the target countries.

