



PEER REVIEW NOTE

Strengthening Kazakhstan's Skills in Petrochemistry and Chemistry through Occupational Standards



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This review was initiated with the Government of Kazakhstan in 2015 and was developed in close collaboration with policy makers and companies in the petrochemical and chemical sector. It was peer reviewed on 26 November 2015 at the OECD Eurasia Competitiveness Roundtable. The Roundtable is a policy network for sharing knowledge on the implementation of competitiveness reforms, and brings together high-level representatives and technical experts from Eurasian countries, OECD member countries and partner organisations.

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ACRONYMS AND ABBREVIATIONS

APEC	Atyrau Petroleum Education Centre
BiBB	Federal Institute for Vocational Education and Training (Germany)
bn	Billion
CEDEFOP	European Centre for the Development of Vocational Training
CEFIC	The European Chemical Industry Council
CEREQ	Centre d'Études et de Recherches sur les Qualifications (France)
CIS	Commonwealth of Independent States
EBRD	European Bank for Reconstruction and Development
EIA	United States Department of Energy, Energy Information Administration
ETF	European Training Foundation
FDI	Foreign Direct Investment
GBP	British pounds
GDP	Gross domestic product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Co-operation)
IEA	International Energy Agency
ILO	International Labour Organisation
ISC	International Systems and Communications Limited
ISCED	International Standard Classification of Education
ISIC	International Standard Industrial Classification of All Economic Activities
KPI	Kazakhstan Petrochemical Industries Inc.
ktpa	Kilo-tonnes per annum
KZT	Kazakh tenge (currency)
LMI	Labour market information
m	Million
Mtoe	Million tonnes of oil equivalent
OECD	Organisation for Economic Co-operation and Development
OS	Occupational standards
PET	Professional education and training
SEZ	Special Economic Zone
SME	Small and medium-sized enterprise
SSC	Sector Skills Council
TAFE Australia	Technical and Further Education Australia
Tcf	Trillion cubic feet
TVET	Technical and Vocational Education and Training

UCC	United Chemical Company
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNESCO- UNEVOC	United Nations Educational, Scientific and Cultural Organisation International Centre for Technical and Vocational Education and Training
USD	US dollars
VET	Vocational education and training
WPC	World Petroleum Council

GLOSSARY

Term	Definition
Accreditation of education providers	A quality assurance procedure which monitors the quality of teaching and learning, and results in a decision as to whether a VET provider or vocational programme meets a threshold standard.
Assessment of qualifications	Testing of knowledge and performance of a student to award a certification of qualifications.
Assessment standard	“Assessment standards” may specify the object of assessment, performance criteria, assessment methods, and the composition of the jury entitled to award the qualification. Assessment standards answer the question “How will we know what the student has learned and is able to do in employment?”.
Awarding bodies	Organisations that award qualifications.
Certification of qualifications	Recognition that a student has achieved a certain level of knowledge and performance by conferring a qualification.
Competence/competency	The ability, encompassing knowledge, skills and attitudes of an individual to perform adequately in a job.
Curriculum	An organised programme of both theoretical and practical studies, the successful completion of which is considered necessary to achieve specified educational goals corresponding to different levels of knowledge and qualification.
Education/training standard	This standard may define the expected outcomes of the learning process, leading to the award of a qualification; the study programme in terms of content, learning objectives and timetable; as well as teaching methods and learning settings, such as in-company or school-based learning. An education/training standard answers the question “What does the student need to learn to be effective in employment?”.
Functional analysis	Functional analysis helps to identify the key purpose of an occupation, the major areas of activity (the main functions) and then break those down into sub-functions. As practised in the United Kingdom, functional analysis uses a consultative process that involves practitioners, managers and in some cases “consumers” of standards.
Occupational standards	The standards of performance that people are expected to achieve in their work, and the knowledge and skills they need to perform effectively.
Outcome-based curricula	Curricula that focus on outcomes (what a student has learned to do).
Qualification	The level of an individual’s preparation to carry out concrete work functions well. A qualification is achieved when a competent body determines that an individual has learned knowledge, skills and/or wider competences to specific standards. A qualification confers an official recognition of skills value in the labour market and in further education and

Qualification framework	<p>training.</p> <p>A qualification framework is a rank order of qualification levels, allowing each qualification to be assigned to a specific rank. It classifies qualifications according to a set of criteria for levels of learning achieved. Typically qualification frameworks cover both vocational and academic qualifications, but they have a particular importance for VET systems given that they can place a very diverse set of vocational qualifications in a common framework.</p>
Qualification system	A qualification system includes all aspects of a country's activity that result in the recognition of learning.
Quality assurance	Refers to systematic, structured and continuous attention to quality.
Quality control	A formal external procedure used to assure quality of teaching, learning and training in private and public institutions providing VET.
Skill	The ability to do something well, expertise.
Skills Council	A permanent working structure that promotes skills development, for example, in a given economic sector (in a case of a Sector Skills Council).
Trusteeship boards	Trusteeship boards monitor the transparency of education institutions, participate in the improvement of the education process, the quality of education, and the improvement of the school facilities.
Upskilling	Short-term targeted training typically provided following initial education or training and aimed at supplementing, improving or updating knowledge, skills and/ or competences acquired during previous training.
Vocational education and training (VET)	Vocational education and training (VET) includes education and training programmes designed for, and typically leading to, a particular job or type of job.

Source: developed by the OECD, drawing also on: OECD (2010), *Learning for Jobs*; European Training Foundation (2013), "Sector Skills Councils. What? Why? How? Contributing to Better VET Relevance to the Labour Market Needs"; CEDEFOP (2009a), *The Dynamics of Qualifications: Defining and Renewing Occupational and Educational Standards*; TengriNews (2012), "Kazakhstan takes 112th place in the Quality of Education", http://tengrinews.kz/kazakhstan_news/kazakhstan-po-kachestvu-obrazovaniya-zanimaet-112-mesto-212838/; Fretwell, D., V. Morgan and A. Deij (2001), *A Framework for Defining and Assessing Occupational Standards in Developing Countries*; CEDEFOP (2009b), *Terminology of European Education and Training Policy: A Selection of 100 Key Terms*; TVETipedia Glossary, www.unevoc.unesco.org/go.php?q=TVETipedia%20Glossary%20A-Z, accessed July 2015.

KEY INDICATORS: KAZAKHSTAN

Country profile		
Population, as of 1 January 2016 (thousand people)	17 671	
GDP, current USD, 2014	217.9 bn	
GDP per capita, current USD, 2014	12 601.7	
GDP growth (annual %), 2014	4.4%	
Oil, gas, petrochemical and chemical industry		
Oil rents as % of GDP, 2013	23.8%	
Share of industrial production in GDP, 2012	32.8%	
- Share of crude oil and natural gas in industrial production, 2014	49.5%	
- Share of processing industry in industrial production, 2014	32.9%	
- Share of petrochemistry in industrial production, 2014	3.0% ¹	
- Share of chemical products in industrial production, 2014	1.2%	
- Share of main pharmaceutical products in industrial production, 2014	0.2%	
- Share of rubber and plastic products in industrial production, 2014	0.9%	
Vocational education and training	Kazakhstan	Atyrau region
Total number of students in VET, 2012	203 974	N/A
Total number of VET graduates, 2013	135 773	4 942

Note: ¹Refers to oil processing products

Source: OECD analysis based on data from Kazakhstan's Committee on Statistics, the Ministry of National Economy of the Republic of Kazakhstan, the Ministry of Education and Science, plus: UNESCO Institute for Statistics (2006), "Participation in Formal Technical and Vocational Education and Training Programmes Worldwide: An Initial Statistical Study"; World Bank (2015), "Indicators", <http://data.worldbank.org/indicator>, accessed February 2016; UNECE (2015), "Kazakhstan: the Share of Industry in GDP", dataset, <http://w3.unece.org/PXWeb/en/TimeSeries?IndicatorCode=11&CountryCode=398>, accessed July 2015; Álvarez-Galván, J. (2014), *A Skills beyond School Review of Kazakhstan*, OECD Reviews of Vocational Education and Training.

INTRODUCTION: OPPORTUNITIES AND CHALLENGES IN DEVELOPING THE PETROCHEMICAL AND CHEMICAL INDUSTRY IN KAZAKHSTAN

Kazakhstan has great potential for developing its petrochemical and chemical industry, taking into account the growing internal and external demand for petrochemical and chemical products, its rich natural resources and proximity to substantial markets. However, the fledgling industry is partly being held back by a lack of suitably skilled workers. Vocational education is of particular importance for the sector, which involves complex industrial processes, equipment and working methods requiring highly specialised technicians. Developing occupational standards for the sector is the first step in making the essential link between workplace employment requirements and training. The process will facilitate dialogue between the government, business and education institutions; standardise the definition of occupations in the sector; make it easier for companies to forecast their skills needs; and improve the responsiveness of study programmes to business requirements. Ultimately, occupational standards will increase the competitiveness of the petrochemical and chemical industry.

Context: Kazakhstan has potential for developing the petrochemical and chemical industry

1. Kazakhstan's economy is highly dependent on natural resources, including oil and gas. Fuel and energy products accounted for 77% of Kazakhstan's exports between January and April 2015 (Committee on Statistics of the Republic of Kazakhstan, 2015). While the oil and gas industry has grown rapidly since 1997, petrochemical and chemical production is currently embryonic, at 3% and 1% of total industrial production in 2014¹ respectively (Committee on Statistics of the Republic of Kazakhstan, 2015).²
2. Kazakhstan is well-positioned to develop its domestic petrochemical and chemical industry as part of its overall diversification efforts because of growing internal and external demand; its proximity to substantial markets; and its rich natural resource endowments.
3. The country's petrochemical and chemical industry already saw positive economic growth between 2008 and 2013 (Annex A, Figures 7-8). For example, the volume of basic petrochemical production more than doubled since 2008, and its gross value added more than tripled (Government of Kazakhstan, 2014).
4. In January 2012, 209 large and medium-sized companies were registered in Kazakhstan under the category of "chemical industry" (Kaznex Invest, 2012). In 2013, 2 021 workers were employed in basic petrochemistry, and 13 703 in the production of chemicals for industry (Government of Kazakhstan, 2014).

Demand is growing – both at home and abroad

5. Petrochemicals and chemicals are used in a wide variety of products. Kazakhstan's domestic demand for petrochemical and chemical products is expected to rise. Kazakhstan's volume of production of basic petrochemical products increased at a cumulative annual growth rate of 17% over 2008-13 (Government of Kazakhstan, 2014). At the same time, Kazakhstan is importing many of its petrochemical and chemical products (see Annex A, Figure 8 for a chemicals for industry example) and could benefit from import substitution with domestic products. In addition, studies forecast that global chemical sales will grow by approximately 3% per year up to 2050 (UNEP, 2013).

Kazakhstan's proximity to substantial markets is an opportunity

6. Kazakhstan is well-positioned to potentially supply petrochemicals and chemicals to China, Russia and Korea, as well as to other countries in the region, such as Azerbaijan, Kyrgyzstan and Ukraine. For example, China is the world's largest consumer of chemicals (ISC and WPC, 2013), and its chemical industry is predicted to grow by 9-11% in 2013-15 (KPMG, 2013). Russia's domestic production of petrochemicals is expected to double by 2017 (ISC and WPC, 2013).

Kazakhstan has rich natural resource endowments

7. For the petrochemical and chemical sector to grow, it is important to have access to low-price feedstock: oil, gas and coal (ISC and WPC, 2013). Kazakhstan is well-endowed in these three commodities (Annex A, Figures 5-6). For example, in 2015 Kazakhstan had proven crude oil reserves of 30 billion barrels and proven natural gas reserves of 85 Tcf, mostly in its petroleum liquids fields.

Kazakhstan has three key challenges in developing its petrochemical and chemical industry

8. In order to foster a successful petrochemical and chemical industry, Kazakhstan needs to overcome several challenges: 1) insufficient technologies for deep processing of oil and gas and for petrochemical companies, as well as the wear and tear of existing equipment; 2) a transportation infrastructure inherited from the Soviet era that is not optimal for transporting raw materials or finished products; and 3) underqualified staff and major skill gaps.³

9. The focus of this peer review note is on vocational education and training (VET) at all levels in the petrochemical and chemical industry and in particular the development of occupational standards (Box 1). Kazakhstan's petrochemical and chemical industry lacks qualified staff. The United Chemical Company (UCC), the institute responsible for bolstering Kazakhstan's chemical industry, has identified staff needs to be almost 6 000 people for the projects that it is overseeing (Annex A, Figure 11) (United Chemical Company, 2015). According to a survey by the European Bank for Reconstruction and Development, inadequate workforce skills is one of the biggest problems faced by Kazakhstan's firms, especially the larger ones (EBRD, 2015).

10. VET is essential for growing the petrochemical and chemical industry, which involves complex industrial processes, equipment and working methods requiring highly specialised technicians. Within the VET system, occupational standards in particular are an essential link between workplace employment requirements and human capital development (i.e. education and training programmes), and affect individuals throughout their lives. Semi-skilled and skilled workers (technicians) make up a large portion of the workforce in the petrochemical and chemical sector, with duties such as process operators, maintenance technicians, laboratory technicians and mechanical testing technicians. As an example, in Germany, which has the most developed chemical industry in Europe, 56% of workers employed in the chemical industry in 2011 were skilled workers with vocational education and training (Annex A, Figure 9). In the United States, which produces 15% of the world's chemicals, production occupations made up about 42% of total employment in the sector in 2009, while installation, maintenance and repair specialists accounted for 10% of the total (Annex A, Figure 10). In 2014, technical roles that require VET level education made up about 70 % of all occupations in basic chemical manufacturing. Worldwide, global competition is driving a trend of continuous up-skilling, re-skilling and multi-skilling of the current workforce, producing better qualified new entrants. Skills upgrading can in turn encourage cluster development in the sector and attract foreign investment (OECD, 2009).

11. Importantly, Kazakhstan should promote environmentally friendly chemicals and petrochemicals, which calls for even more specialised skills. As an example, greenhouse gas emissions have been falling in the EU chemical sector since 1994, while production has increased by 60% (Petrochemicals Europe, n.d.).

Overall recommendation: develop occupational standards in petrochemistry and chemistry to foster employer engagement and support the establishment of a well-functioning VET system

12. Kazakhstan currently lacks any occupational standards for petrochemistry. A few standards have been developed for the chemical sector, but employers were not sufficiently involved in the process.

13. Focusing on occupational standards will facilitate dialogue between the government, business and education institutions. In addition, it will standardise the definition of occupations in the sector and will make it easier for companies to forecast their short, medium and long-term skills needs. Finally, it will improve the responsiveness of study programmes to business requirements by basing them on a common understanding of what students must be able to learn and be able to do by the end of their studies. Ultimately, occupational standards will increase the competitiveness of the petrochemical and chemical industry.

Box 1. What are occupational standards?

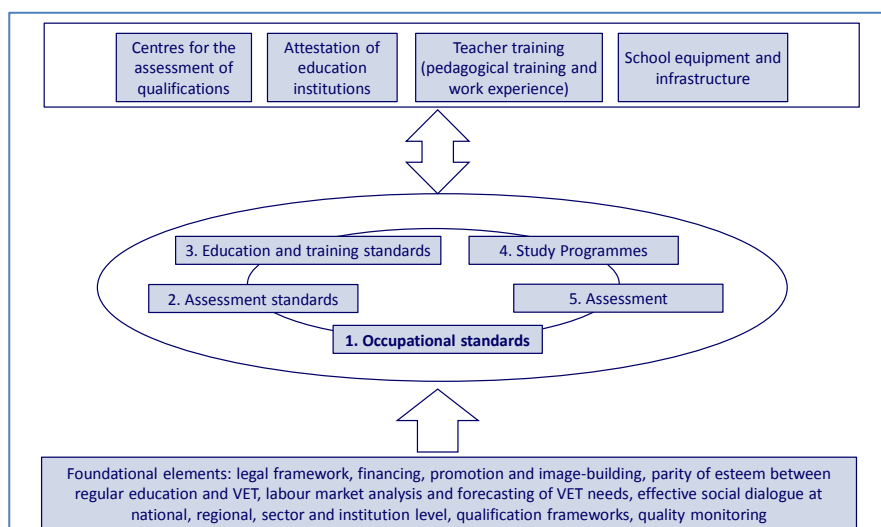
Occupational standards (OS) (sometimes also called professional or competency standards) are standards of performance that people are expected to achieve in their work, as well as the knowledge and skills they need to perform effectively (see Figure 13 in Annex A for a UK example). A standard for an occupation (e.g. carrying out maintenance in downstream operations) is usually a document that lists:

- the tasks and activities expected to be carried out (e.g. check status of all relevant utilities, such as steam, water, electrical, pneumatic systems)
- the knowledge and skills required (e.g. how to use the company's Safe Systems of Work processes to identify hazards and mitigate or reduce risks to as low as reasonably practicable)
- (sometimes) the work conditions/context which might affect the required activities, knowledge and skills.

In addition to the technical skills directly relating to an occupation, occupational standards also demand a standard of performance in “core skills” such as numeracy, literacy and information technology (IT), and “life skills” such as communication, problem solving, decision making, team working, etc.

Occupational standards are a key component of an effective VET system (Figure 1). By aligning terminology on occupations, they facilitate public-private dialogue, and improve transparency and communication among all stakeholders. They also facilitate supply and demand analysis and maintenance of statistics due to streamlined terminology. They optimise the responsiveness of education programmes to business demands. Occupational standards have been linked to improved human capital development and productivity increases.

Figure 1. Occupational standards are part of a comprehensive VET system



Occupational standards offer additional benefits for the private sector and for education institutions (Annex A, Figure 12). They assist employers in identifying employee competency gaps to improve in-company training, in developing job descriptions, recognising competencies and qualifications, transferring foreign technologies and organising work processes. Development of occupational standards often also involves closely associated activities, especially functional analysis, which enables industry to identify in a strategic and forward-looking way the optimal mix of occupations needed in the short, medium and long term. Educational institutions and employers then use occupational standards for developing standard-based qualifications and curricula, and skills assessment and certification instruments (see Glossary for definitions).

Source: OECD analysis; OECD (2010), *Learning for Jobs*.

14. The Government of Kazakhstan has rightly recognised the importance of occupational standards and of education standards based on them. Despite this, there are currently no occupational standards in petrochemistry, and few in chemistry, and their practical application is lacking. The government will need to ensure that it creates a smoothly functioning domestic institutional system for occupational standards, as well as competency-based curricula and assessment, with appropriate employer engagement (see Box 2 for a case study of Atyrau region).

Box 2. Case study: vocational education and training for petrochemistry in Atyrau

Kazakhstan's Atyrau region in the west of the country has great potential for petrochemical production. In 2014, Atyrau accounted for 48% of Kazakhstan's total oil and gas production. The region is near to some of Kazakhstan's major oil fields, as 90% of explored fields are in western Kazakhstan (Dzekunov et al., n.d.). The Programme for Industrial-innovative Development of Kazakhstan for 2015-2019 identified petrochemistry and the production of chemicals for industry as priority sectors for Atyrau. The Integrated Petrochemical Complex located in the region is targeting polypropylene production of 500 000 tonnes per year and polyethelene production of 800 000 tonnes per year. The Atyrau refinery is being upgraded to construct an aromatics hydrocarbon facility, which will enable it to begin production of benzene and paraxylene – basic products for Kazakhstan's petrochemical industry. To do so, the region would require staff with strong vocational education and training to satisfy the demands of the industry.

However, in spite of this context, Atyrau's colleges do not yet offer specialised courses in petrochemistry. Some institutions are considering creating programmes in this field (for example, Atyrau Polytechnic College and the Atyrau Petroleum Education Centre - Atyrau Petrotechnic). Atyrau Petrotechnic conducts training in oil and gas, and is establishing links with oil and gas companies in the region. It is planning to introduce a few chemistry programmes in the short term. The United Chemical Company is also considering creating a competence centre to train staff for the Atyrau petrochemical complex. The existence of occupational standards in petrochemistry and chemistry would facilitate these endeavours, and align companies and education institutions around a common understanding of occupations in this industry.

Source: OECD interviews 2013-2015; KPI Inc. (2015), *Atyrau Petrochemical Complex*; Dzekunov et al. (n.d.), *Petrochemical Industry: Global Experience in Developing it and Kazakhstan's Potential*; Polytechnic College (2015), *VET Experience of Atyrau Polytechnic College*; United Chemical Company (2015), "Programme Concept for the Professional Preparation of Staff for Chemical Companies"; Business Monitor Kazakhstan (2013) "Oil and Gas Report Q2"; KazMunaiGas (2015), "Modernisation of Refineries, www.thkmg.kz/en/modernization."

The development of occupational standards will need to overcome several obstacles

15. The OECD has identified three main challenges to the development of occupational standards and their integration in the VET system in the sector, with relevance for other sectors of Kazakhstan's economy.

The institutional framework is weak

16. The domestic structure for creating, monitoring and updating occupational standards is sub-optimal, and there is no body responsible for developing occupational standards in petrochemistry or chemistry.

17. The Ministry of Healthcare and Social Development has a small team, fewer than ten people, acting as a secretariat for developing occupational standards in Kazakhstan, with input from other ministries. This is insufficient to deal with all economic sectors. As a comparison, each of the UK sector skills councils, responsible for occupational standards, have about 30-80 people (Annex A, Figure 15). This institutional weakness is especially relevant in view of Kazakhstan's plans to develop

occupational standards for all sectors of the economy by 2020 (Central Communications Service under the President of the Republic of Kazakhstan, 2015b). The National Chamber of Entrepreneurs, which is charged with co-ordinating the work on occupational standards from 2016, does not yet have a plan of action for this new role. Additionally, other organisations have tried to establish their own occupational standards – including the Atyrau regional government, the Polytechnic College in Atyrau, the United Chemical Company, KazEnergy association and the Atyrau Chamber of Entrepreneurs. However, none of these were for petrochemistry and very few for chemistry. This multilateral action also leads to incompatibility in the terminology used to describe occupations, making it difficult for stakeholders to forecast their skills needs or to create study programmes.

18. The Government of Kazakhstan has taken some initial steps towards improving public-private dialogue, for example by establishing skills councils at national, regional and sector levels. However, employers are not sufficiently involved in the process of developing occupational standards. For instance, Kazakhstan's VET Council on the Petrochemical Industry does not have enough private sector representatives and has no role in developing occupational standards. It is in fact unclear which sector association represents the interests of the petrochemical industry in developing occupational standards. In addition, several petrochemical companies that were interviewed within the framework of the OECD Kazakhstan Regional Competitiveness project were not aware of the government initiative to develop occupational standards in this sector. Even the state-owned United Chemical Company, which is responsible for developing the chemistry sector, was not involved in developing the occupational standards in this sector. The standards established for other sectors of the economy by the Ministry of Healthcare and Social Development only involved employers at the review stage, but not in the development process.

19. Finally, Kazakhstan lacks local experts on occupational standards and on competency-based education, because even though Kazakhstan has contributed to the development of occupational standards, so far their development has taken place within the framework of international projects.

There are no mechanisms for applying occupational standards in the VET system

20. Occupational standards must form the basis for study programmes and for the assessment of qualifications. The government has recently recognised the importance of the link between professional and educational standards and has expressed the wish that occupational standards form the basis for study programmes and the retraining of specialists (Central Communications Service under the Republic of Kazakhstan, 2015b). However, the current VET system does not have an effective mechanism for translating occupational standards into education curricula, or for the assessment and certification of qualifications. Existing education standards do not specify that they must be based on occupational standards, and Kazakhstan's curricula are not oriented towards learning outcomes. In addition, four independent pilot assessment centres have been established by professional sector associations for six sectors (metallurgy, oil and gas, tourism, machine building, information and communication technologies, construction and utilities). However, none of these centres conducts assessments based on occupational standards. In the future, the government plans to charge the National Chamber of Entrepreneurs with forming independent assessment centres – it should ensure that their assessments are founded on occupational standards.

Awareness of occupational standards is poor

21. Given their novelty, there is a lack of awareness, especially in the private sector and among regional stakeholders, of the overall concept and the practical application of occupational standards and competency-based education in Kazakhstan, or of the existing government initiatives. This leads

to a lack of co-ordination of existing initiatives. The lack of awareness was confirmed in Atyrau region and at national level during meetings with some education institutions and private companies.

Notes

¹ These data do not include the production of pharmaceutical products (0.2% of industrial production in 2014).

² The definition of the petrochemical and chemical industry for the purpose of this note follows revision 4 of the International Standard Industrial Classification of All Economic Activities (ISIC). It includes the manufacture of refined petroleum products; manufacture of chemicals and chemical products (basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms), manufacture of other chemical products (pesticides, paints and inks, soap, cleaning preparations, perfumes and toilet preparations, explosives and pyrotechnic products, chemical preparations for photographic uses, gelatins, composite diagnostic preparations etc.), manufacture of man-made fibres; manufacture of basic pharmaceutical products and pharmaceutical preparations; and manufacture of rubber and plastics products.

³ In addition, the bulk of gas feedstock is used for technological needs of the industry rather than in petrochemical production.

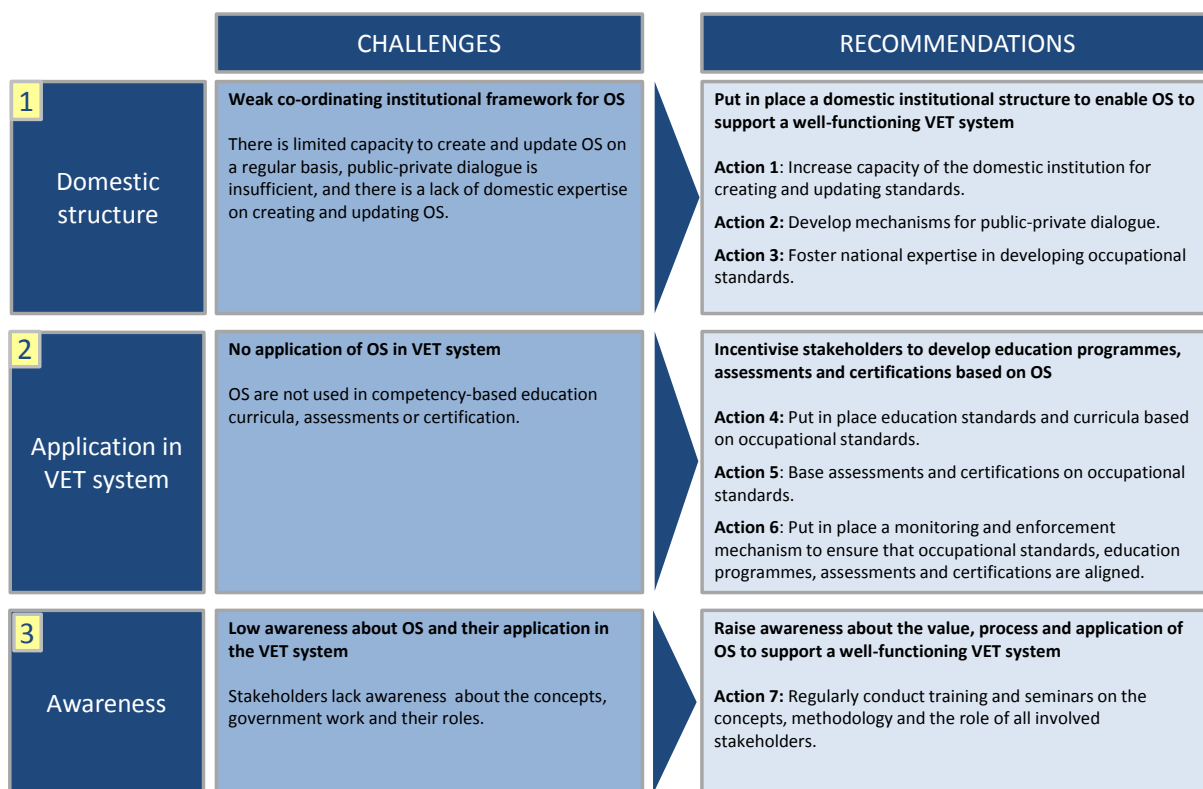
RECOMMENDATIONS FOR DEVELOPING OCCUPATIONAL STANDARDS IN PETROCHEMISTRY AND CHEMISTRY IN KAZAKHSTAN

This section recommends several actions, based on international good practice, to address the challenges encountered in developing occupational standards and to integrate them into Kazakhstan's vocational education and training (VET) system for the petrochemical and chemical industry:

1. *Strengthen the institutional structure*: support the institution for developing and updating occupational standards to support a well-functioning VET system.
2. *Incorporate occupational standards into the VET system*: encourage stakeholders to develop education programmes, assessments and certification based on occupational standards.
3. *Raise awareness*: raise awareness about the value, process and application of occupational standards to support a well-functioning VET system.

22. Figure 2 summarises the main policy challenges and corresponding recommendations for the Government of Kazakhstan.

Figure 2. Overview of challenges and policy recommendations



Putting in place a domestic institutional structure to enable OS to support a well-functioning VET system

23. The Government of Kazakhstan should strengthen the permanent domestic structure for creating, monitoring and updating occupational standards. Implementing this recommendation will involve three actions: 1) strengthening the institution responsible for creating and updating occupational standards, backed up with sufficient, qualified staff and appropriate financing; 2) developing mechanisms for public-private dialogue; and 3) fostering domestic expertise in developing occupational standards.

Action 1: Strengthen the domestic institution for creating and updating standards

24. A single institution, such as a skills council, should be responsible for occupational standards in petrochemistry and chemistry, and should act as a secretariat for their development. The institution should ideally be outside government, to avoid it being dominated by civil servants. Having one institution with clear responsibility and powers will be important for streamlining procedures and standards (see Annex A, Figure 14 for good practice examples). For example, in the United Kingdom, a skills council called Cogent Skills maintains occupational standards in science-based industries (see Annex A, Figure 15). In Ukraine, the Institute of Professional Qualifications is a non-governmental co-ordinating body aiming to contribute to a commonly recognised system of professional qualifications, including assistance to employers in developing occupational standards (Kolyshko, 2014). In order to prepare for establishing a formal body in charge of developing occupational standards, a working group could be established to launch the process in the petrochemical and chemical industry at the national level. The institution must have access to labour market information to help identify the skills and qualifications that are in demand. It could either gather this data on its own, or commission it from other organisations (Annex A, Figures 16-17). Labour market information is also important for career guidance and for accrediting VET programmes based on their correspondence to market needs. To date, career guidance services in Kazakhstan's VET institutions do not seem to have adequate data to undertake their work effectively (Álvarez-Galván, 2014). It is also recommended that the institution study current national and international trends in sector employment and forecast future trends for the sector to help it decide which qualifications and occupational standards should be introduced. It should then conduct working sessions with employers to define the standards. Once agreed, the standards must be made available on the registry of occupational standards, maintained by the Ministry of Healthcare and Social Development and the Ministry of Justice. The institution should regularly update the standards, either through a formal, timetabled approach or through an informal approach, "on the demand" of employers.

25. The institution will need sufficient funding – for core staff and infrastructure, as well as for the working sessions with employers. Standards-setting organisations usually rely on a variety of funding sources: from government resources, international resources, grants and levies from stakeholders, product sales and services, etc. In the United Kingdom, Cogent Skills spent on average EUR 61 215 on finalising 30 occupational standards (the range in the UK is approximately EUR 40 810 – EUR 122 428), excluding costs to employers for sending their employees to standard development sessions (Cogent Skills, 2014). On the other hand, it is standard practice for employers to cover their employees' costs in working sessions with employers. In France, a specific tax on salaries is paid by enterprises to fund vocational training. Enterprises can be partially exempted from this tax when their employees take part in vocational training, for example, as members of bodies in charge of assessment or designing qualifications.

26. Should funding be limited, then generic occupational standards could be adopted from other countries. Generic occupational standards are non-sector-specific (e.g. financial management or

human resource management). However, sector-specific occupational standards should be developed by the sector itself. This could possibly be done by adapting overseas occupational standards, but not by adopting external examples unchanged.

Action 2: Develop mechanisms for public-private dialogue

27. International good practice dictates that occupational standards must be employer-led to ensure that they reflect business needs (Annex A, Figures 18-19). To achieve this, Kazakhstan should establish effective mechanisms for public-private dialogue, including:

- **Strategic public-private working sessions:** public-private working sessions are the ideal forum for developing occupational standards. They must bring together a mix of employer and employee representatives. Ideal representatives of the “employer” are actual job holders or first line supervisors. If they are not available, training managers and people responsible for relevant business functions (e.g. managers of departments concerning manufacturing, quality assurance, engineering and technology) could participate. Should human resource managers be involved, it would be mainly to support the process, with the substantive part being developed by the employer representatives. The working groups can be complemented by interviews, company visits, document analysis and surveys (Bosch and Spilioti, 2013). Since private sector participation is not well developed in Kazakhstan, the government could encourage it by using a range of tools, such as financial support or memoranda of understanding with employers.
- **Well-structured and strong professional sector associations:** the Government of Kazakhstan should ensure that sector associations for petrochemistry and chemistry are well-developed and can voice their concerns to the institution charged with developing occupational standards. However, the petrochemical industry does not have its own sector association. The KazEnergy sector association currently represents the interests of the oil and gas sector, and the government-run holding United Chemical Company and the chemical industry union represent the interests of several chemical companies. A special effort must be made to include SMEs in the associations, as their needs might be quite different from larger companies.

It must be kept in mind that in a context in which the private sector is not used to close collaboration with the education sector, the government might need to play a leading role. For example, in most EU partner countries, it has been difficult to involve industry in the development of new occupational standards, therefore public authorities have had to remain the driving force (ETF, 2011a). This is due to the lack of representative organisations at national and sectoral levels, as well as the absence of professional capacity among social partners to deal with VET matters in the context of reform.

- **Strong links between the industry and the VET system:** the Government of Kazakhstan should take into account any other means to engage employers in the VET system. This includes strengthening the Kazakhstan VET Council on the Petrochemical Industry by including an adequate number of private sector representatives; increasing transparency in its decisions, meeting dates and outcomes; and ensuring that membership information is made available online. Boards of Trustees in education institutions should also include enough private sector representatives. Work-based training promotes partnership between education providers and employers and must be encouraged (OECD, 2014a). This comprises apprenticeships, informal learning on the job, work placements that form part of formal vocational qualifications, and internships of various types. In the longer term, Kazakhstan is

urged to encourage education institutions to obtain more of their funding from the private sector itself.

Action 3: Foster national expertise in developing occupational standards

28. Domestic expertise is very important for occupational standards, as they are more effective and have more stakeholder buy-in when they are developed domestically. The Kazakh national structure for occupational standards should ideally be supported by two types of local expertise:

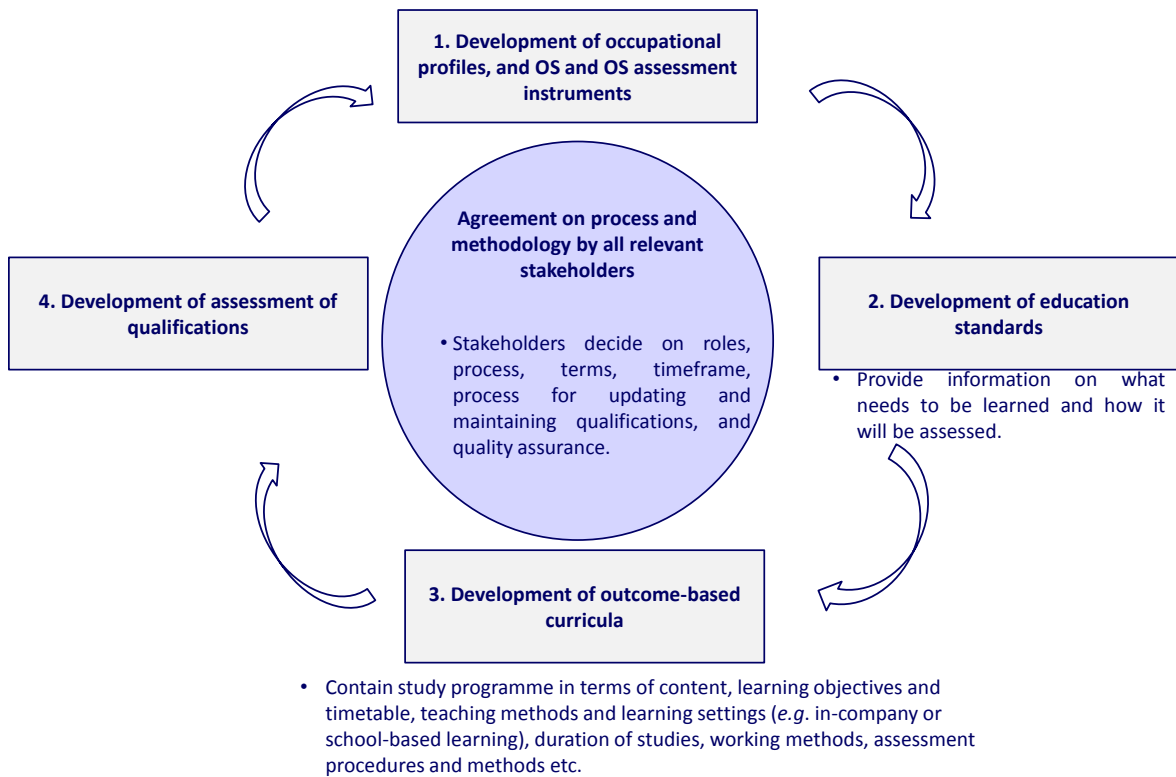
- 1) Technical experts with knowledge of the industry who can lead the standard-development sessions with employers. The role of these experts would be to moderate working sessions with industry representatives to agree on the content of occupational standards. These experts should ideally be Kazakh nationals with a good knowledge of the industry and of the education sector. They will need to be trained in occupational standards methodology to avoid the risk of over-emphasising the technical side to the detriment of the other aspects of employability.
- 2) Local experts with knowledge of the local education and VET system. These experts should work in the secretariat for creating and updating occupational standards.

29. To build national expertise, effective mechanisms should be used to exchange knowledge between international experts and domestic experts. Any local staff participating in international projects must pass on their knowledge to other local stakeholders in the ministries and associations through training sessions. To begin with, a survey of existing experts is recommended. Lists of local experts with knowledge of developing occupational standards should be maintained and regularly updated to keep track of experts from government agencies and companies.

Integrating occupational standards into the VET system

30. The value of occupational standards lies in their use by the education system and employers to create study programmes, as well as to guide assessments and certification. Occupational standards are part of an integrated VET system, providing the basis for education standards, outcome-based curricula, and assessment of qualifications (Figure 3). This second recommendation includes three actions: 1) put in place education standards and curricula based on occupational standards; 2) base assessments and certification on occupational standards; and 3) put in place a monitoring and enforcement mechanism to ensure that occupational standards, education programmes and certifications are aligned.

Figure 3. The link between occupational standards, curricula and assessment



Source: Bosch, P. and C. Spilioti (2013), “OPEP: From Occupational Profiles to Educational Standards and Programmes: a Roadmap Based on Practical Experiences”, Fretwell, D., V. Morgan and A. Deij (2001), *A Framework for Defining and Assessing Occupational Standards in Developing Countries*; Cedefop (2009a), *Dynamics of Qualifications: Defining and Renewing Occupational and Educational Standards*.

Action 4: Put in place education standards and curricula based on occupational standards

31. Despite their cost, competency-based curricula, which focus on outputs (what students learn to do) are gaining popularity the world over, because of their greater ability to respond to employer needs. For example, they are used in Australia (Annex A, Figure 20), New Zealand and most European countries. Kazakhstan is urged to create competency-based curricula based on occupational standards, which it can facilitate through education/training standards (see Glossary).

32. Education/training standards should contain information on outcomes and processes. For example, they can contain information about:

- learning content (such as the required learning activities)
- teachers (the required teaching methods and teacher qualifications)
- the assessment of achievement (methods to be used and evidence required)
- process (such as the duration of programmes and the desirable learning location or environment).

33. Even though the required teaching methods are set out, teachers should retain the possibility for implementing their own initiatives and for teaching additional aspects beyond the standards. It should be kept in mind that students might not be able to learn all competencies in the education institution, therefore education onsite in a company or at least in a control room or maintenance shop is very important for teaching how to use work equipment. Kazakhstan is strongly encouraged to include credit-bearing segments of work-based learning in any VET programme to ensure alignment between occupational standards, curricula and industry needs.

34. The content and format of education standards vary from country to country; Kazakhstan should select a structure that suits its circumstances. The government should develop education/training standards through stakeholder working groups, interviews and questionnaires with employers and employees, and visits to companies.

35. Employers and education institutions must then create study programmes based on the guidelines provided by such standards and involve awarding bodies (organisations that award qualifications) from the beginning of the process. While some organisations that develop education/training standards also develop curricula, the co-ordinating institution should delegate this time-consuming task to a different organisation or at least a different department. Due note must be given here to the training of teachers, to ensure that they can deliver training programmes of good quality.

Action 5: Base assessments and certification on occupational standards

36. Kazakhstan is urged to base its assessment tools for graduates on occupational standards (competency-based assessment). This means that in addition to education/ training standards, it should use assessment standards to test what a person is able to do in his or her occupation, including knowledge, skills and performance. In most European countries, for example, qualifications (diplomas) are based on three types of standards: occupational/professional standards, education/training standards and assessment standards.

37. The assessment of a given occupational standard must clearly test the demand that the occupational standard places on the future employee. The competences that students have gained outside of an academic course should also be assessed. Assessment standards should also be used to recognise competencies gained on the job, to up-skill and re-skill the current workforce. The assessment standards can include knowledge tests in written or oral format, as well as observation of work performance (UNESCO-UNEVOC, 2006).

38. While assessment standards will usually be written by the same organisation that developed the occupational standards, *e.g.*, a sector skills body, they also require pedagogical and industry input. As a minimum, they should be developed together with the stakeholders who helped to write the initial occupational standards. It is advisable that assessment instruments and bodies be run by private companies. They will need both trained assessors and verifier personnel (who verify that assessors themselves are performing well; most of them are former assessors themselves), who could be both internal and external to companies. The Government of Kazakhstan and/or the assessment companies must adequately train staff to conduct assessments properly, and share the assessment requirements with students and trainers. Particular attention is needed for standardising the assessments across the country, including assessment conditions (*e.g.* working environment for the practical aspect). Additionally, care must be taken to avoid redundant assessment layers.

Action 6: Put in place a monitoring and enforcement mechanism to ensure that occupational standards, education programmes, assessments and certifications are aligned

39. Once the framework for qualifications and certification is in place, Kazakhstan should establish a monitoring and enforcement mechanism. It should task qualified inspectors to visit training institutions and evaluate the adherence of study programmes and assessment instruments to the developed occupational standards (see Box 3 for an example from France). In Kazakhstan, this could be the role of a skills council.

Box 3. France's system for monitoring qualifications

The system of inspection in France consists of two levels:

- General Inspectorate for National Education (IGEN - Inspection Générale de l'Éducation Nationale). This organisation is responsible for monitoring, studying and assessing the education system's operation and effectiveness. Its evaluations focus particularly on the types of training, programmes, teaching content, teaching methods, procedures and resources implemented. It also assesses management, teaching and inspectorate staff, as well as taking part in evaluation missions alongside other departmental, regional education authorities and international bodies. The general inspectorate is also in charge of a specific body called CERPEP, which helps to enhance links between teachers and companies, especially by organising internships for teachers in private or public companies in France and elsewhere in Europe. These internships help teachers to better understand the specific needs of the sector, and to be aware of any changes in technology.
- Regional inspectorates. The regional inspectorates are assigned to specific territories, and the inspectors are state officials. They are under the authority of their area's Chief Education Officer and work in liaison with the Inspectorate General. Among other things, they assess teaching content, teachers and schools. In the specific field of VET, they are also in charge of organising and monitoring examinations, and can lead or participate, at national level, in the groups of experts (from the education sphere and economic sectors) in charge of designing qualifications. They are also in charge of disseminating information about sector needs and changes in the qualifications of their field of expertise.

Raising awareness of the value, process and application of occupational standards for a well-functioning VET system

40. The creation and application of economically effective occupational standards heavily depends on input from key stakeholders. Employers are the main participants in the creation of standards and must be aware of the procedure, as well as their expected role. Similarly, education institutions must be aware of the existing standards and the process for applying them to their education programmes and assessments. Thus, it is recommended that the Government of Kazakhstan regularly conduct training and seminars on the concept, methodology and the role of all stakeholders.

Action 7: Conduct regular training and seminars on the concepts, methodology and the role of all stakeholders

41. The institution in charge of occupational standards should conduct regular training in the concept; the methodology it expects companies to use; their integration into curricula, assessments and certification; and the role of various counterparts in the process. The training should be targeted at government officials, employers, and actors in the education sphere who design curricula, assess and award qualifications. The Government of Kazakhstan should intensify its efforts to reach out to the

regions and private companies. International experts in the subject should be invited to these seminars, especially at the beginning of the process. Training must include workshops and other participative forums for developing the actual draft occupational standards.

42. Importantly, the benefits of occupational standards should be clearly communicated to stakeholders to encourage them to participate in creating and applying them. For example, employers should be informed about the occupational standards' positive impact on productivity, the quality of the product, cost savings, new work processes, new technology adoption and innovation.

43. As it can take several years for a national structure of occupational standards to have an impact on education and employment, it is important that a sense of urgency is communicated during the training and seminars.

44. The government should also conduct similar training on competency-based curricula which are based on occupational standards, because they are likely to involve new ways of teaching and learning.

IMPLEMENTATION GUIDELINES

45. This section outlines some guiding principles for implementing the policy recommendations outlined in the previous chapter and suggests a timeline for implementation.

46. Successful implementation of the policy recommendations will depend on the following factors:

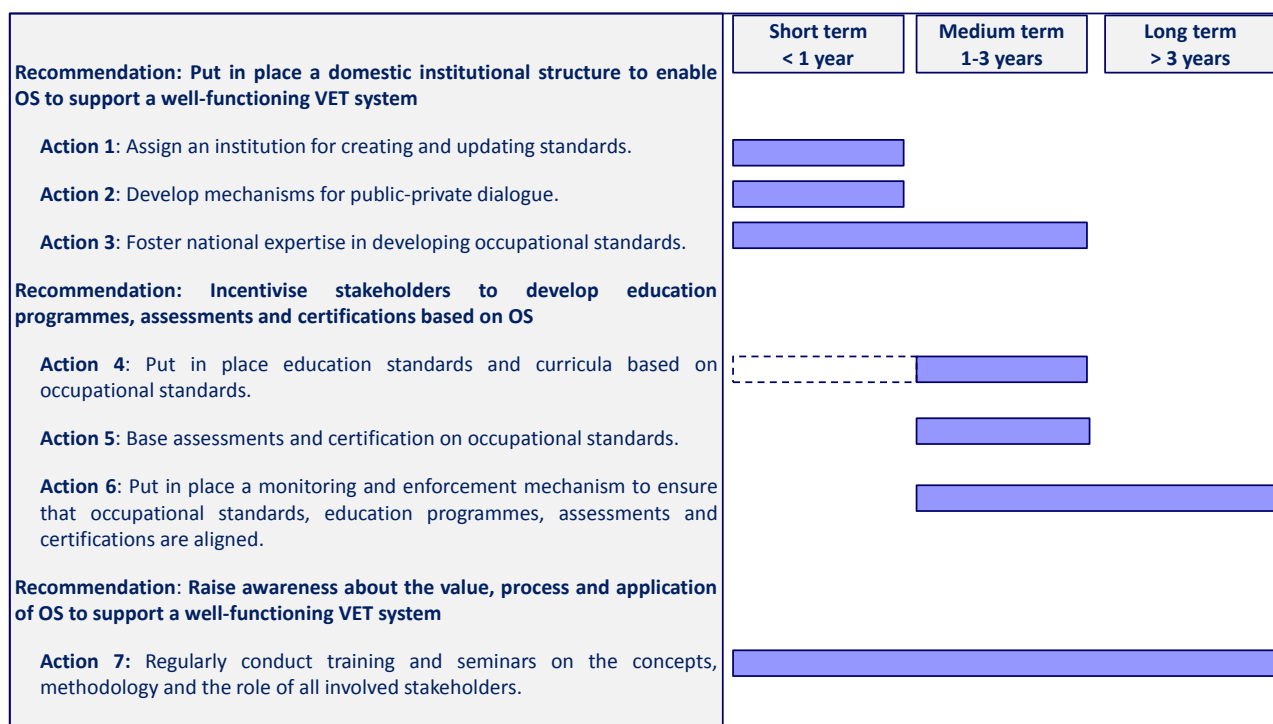
- **Continuous consultation with all relevant VET stakeholders.** The Government of Kazakhstan should consult with the users of occupational standards – employers – in creating the standards. It must also consult with education institutions to determine the applicability of occupational standards in education curricula, assessments and the certification of qualifications. This is crucial for ensuring the relevance and application of the occupational standards. A first helpful step might be to develop a matrix showing the roles of all the stakeholders involved (Bosch and Spilioti, 2013).
- **Policies based on accurate statistics and evidence-based analysis of the VET system.** Any decisions to create or modify occupational standards must be based on statistics and analysis of the need for qualifications, drawn from labour market analysis and employer feedback.
- **Policy design and implementation that draws from international and existing domestic experience.** The Government of Kazakhstan should follow international good practice in creating and applying occupational standards. While relatively new in the post-Soviet economies, occupational standards have a longer history in European education systems and in other countries such as Australia and Canada. Kazakhstan can also draw from domestic experience in developing occupational standards for other sectors, such as oil and gas, and tourism.
- **Effective monitoring and evaluation.** Kazakhstan is urged to continuously monitor its occupational standards and their use to see if they are easy to understand and apply, and if there is a need for additional standards. To be cost effective, only useful occupational standards are to be kept; too many standards should be avoided. The government also needs to keep track of the quality of the entire VET system, including stakeholder involvement, the rate of VET trainee employment after completion of training etc. (Bosch and Spilioti, 2013).
- **Strong leadership.** The development and application of occupational standards requires strong government leadership, as well as leadership of sector associations. It is also useful to have a pioneer company in petrochemistry or chemistry that is firmly committed to the issue to promote occupational standards and rally other companies in the sector.
- **Well-sequenced changes.** It is important to keep in mind that other aspects of the VET system must be improved in order to ensure that occupational standards have a lasting effect. Improvements are needed to the quality of infrastructure, teaching and work-based learning; as well as to forecasting skills needs, independent assessment, statistics on skills, and the

assessment of government activity. Additional recommendations for improving the VET system in Kazakhstan can be found in the OECD publication *OECD Reviews of Vocational Education and Training, A Skills beyond School Review of Kazakhstan* (see Box 4 for more details).

- **Piloted change.** Kazakhstan is encouraged to run a pilot scheme for developing occupational standards to attempt to satisfy some urgent industry needs before the structures and processes are fully developed. This pilot scheme could focus strategically on the most needed skills and levels. For this, a clear understanding of skills requirements is necessary.

47. Figure 4 presents a roadmap for policy implementation, including the expected timeframe for each of the individual policy actions.

Figure 4. Suggested implementation timeline



Box 4. Skills beyond School: Review of Kazakhstan

Skills beyond School is an OECD policy review of post-secondary vocational education and training, which looks at the preparation of younger people and adults for technical and professional jobs. Key policy challenges that are examined include responsiveness to labour market needs, as well as inclusion, access, career guidance, finance, governance, teaching quality, integration with workplace learning, qualifications and assessment.

The OECD Skills beyond School Review of Kazakhstan (Álvarez-Galván, 2014) is based on the analysis presented in a background report prepared by Kazakhstan's former Ministry of Education and Science, the findings of an OECD mission to Kazakhstan and previous OECD work with the country. The framework for the assessment is provided by the analysis of vocational education and training systems developed by both the Learning for Jobs exercise – undertaken in 17 countries – and the more recent Skills beyond School exercise that is also taking part in several countries.

Among the strengths of Kazakhstan's programmes, the OECD highlights the following: the good quality of some VET colleges, recognition of the central role of workplace learning in developing VET, aspiration to an independent certification system, development of advisory councils, and efforts to improve teachers' training. Challenges and recommendations identified are the quality improvement of VET programmes; co-ordination of the entire VET system, including strengthened interaction between VET schools and employers; strengthening the identity and recognition of post-secondary VET; improving the assessment and certification processes and enhancing workplace learning.

Source: OECD (n.d.), "Skills beyond School - The OECD Review of Postsecondary Vocational Education and Training", webpage, <http://www.oecd.org/edu/innovation-education/skillsbeyondschool.htm>, accessed August 2015; Álvarez-Galván, J. (2014), *A Skills beyond School Review of Kazakhstan*, <http://dx.doi.org/10.1787/9789264221826-en>.




ANNEX A: SUPPORTING ANALYSIS

This annex contains supporting data and information on the policy context, overall recommendation, policy challenges and detailed recommendations. An electronic version is available upon request.

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Figure 5. Kazakhstan has significant potential to supply the petrochemical industry (1)

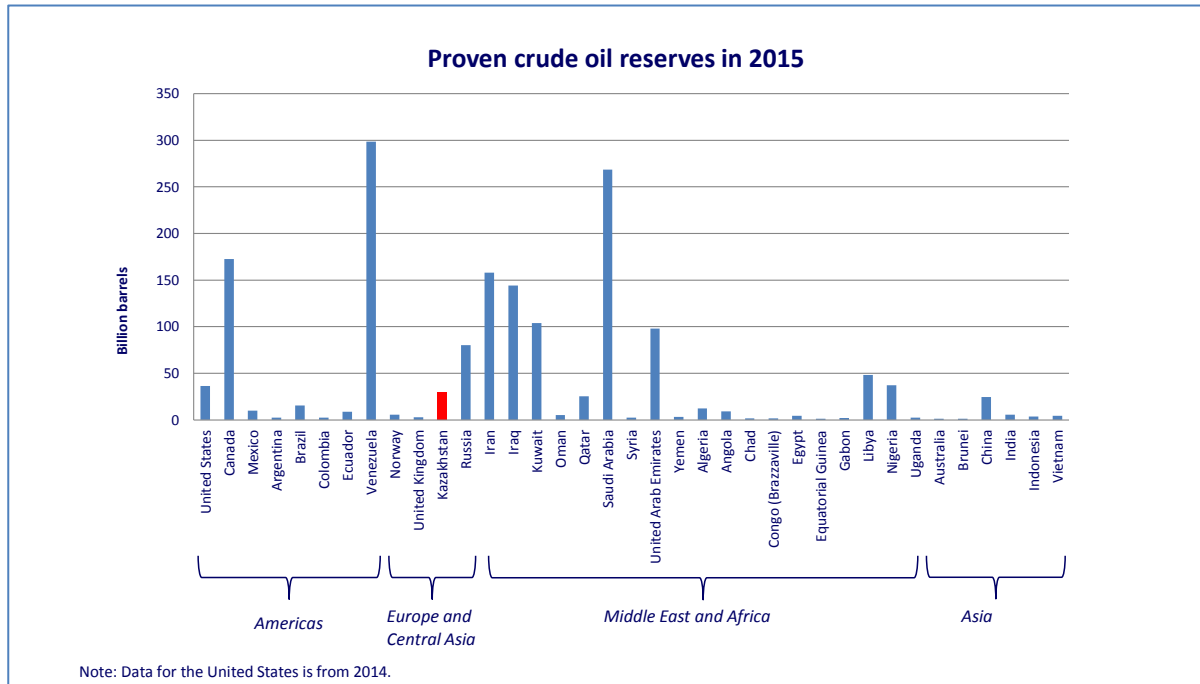
	Reserves	Production
Crude oil 	<ul style="list-style-type: none"> • 30 billion barrels (2015) • 1.8% of world reserves (2014) • 2nd among post-Soviet economies 	<ul style="list-style-type: none"> • 85.21 Mtoe¹ (2013) • 15th out of 141 countries (2013) • 2nd among post-Soviet economies
Natural gas 	<ul style="list-style-type: none"> • 85 trillion cubic feet (Tcf) (2015) 	<ul style="list-style-type: none"> • 30.69 Mtoe (2013) • 22nd out of 141 countries
Coal 	<ul style="list-style-type: none"> • 37 038 million short tons (2011) 	<ul style="list-style-type: none"> • 52.4 Mtoe (2013) • 10th out of 141 countries

Notes: (1) Mtoe - Million tonnes of oil equivalent
(2) Tcf – Trillion cubic feet

Source: IEA (n.d.), “*Energy Atlas*”, International Energy Agency website, www.iea.org/statistics/ieaenergyatlas/; EIA (n.d.), “International energy statistics”, www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm.

Kazakhstan has significant reserves and produces three feedstocks for the petrochemical industry: crude oil, natural gas and coal. It ranks highly in terms of their production volumes. Crude oil, natural gas and coal are used in the petrochemical and chemical industry to produce intermediate feedstocks (ethane, propane, butanes, naphtha, gas oil, ethylene, propylene, butenes, and butadiene), which are then transformed into plastics, liquids and resins, and can also be transformed into high value-added specialty and fine chemicals.

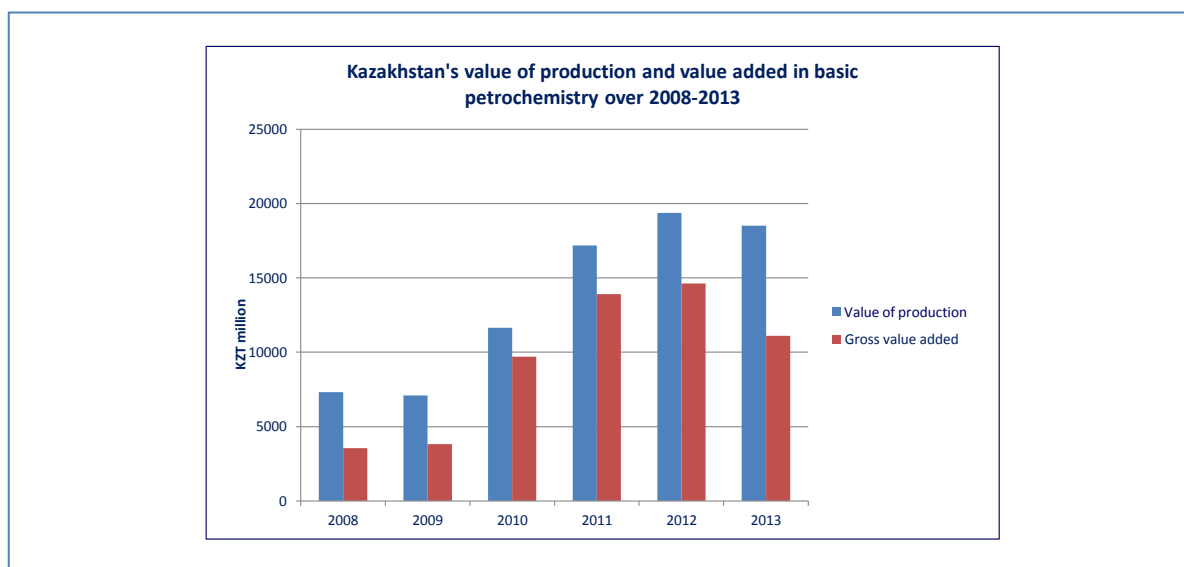
Figure 6. Kazakhstan has significant potential to supply the petrochemical industry (2)



Source: EIA (n.d.), "International Energy Statistics", www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm, accessed June 2015.

Kazakhstan's crude oil reserves fare well on the global scale.

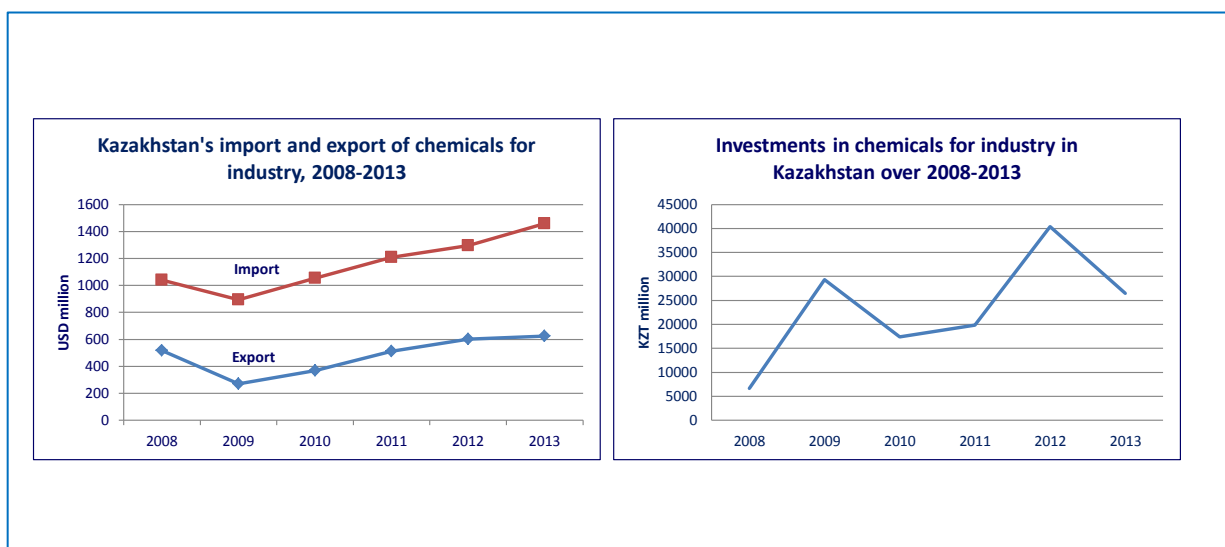
Figure 7. Value of production and trade in basic petrochemistry has grown, 2008-2013



Source: Government of Kazakhstan (2014), "Programme for Industrial-innovative Development of the Republic of Kazakhstan for 2015-2019".

Kazakhstan's trends in basic petrochemistry between 2008 and 2013 were positive. Its gross value of production, gross value added, imports and exports increased since 2008. Imports are higher than exports and are growing more quickly.

Figure 8. The chemical sector has also gained momentum in Kazakhstan, 2008-2013



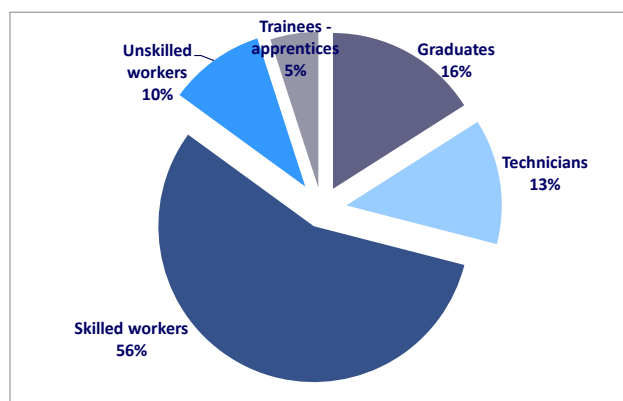
Source: Government of Kazakhstan (2014), "Programme for Industrial-innovative Development of the Republic of Kazakhstan for 2015-2019".

Kazakhstan's chemical subsector (chemicals for industry) has registered positive economic trends in investment, imports and exports. Again, there is a clear gap between imports and exports.

Figure 9. Vocational education and training is key to building a successful petrochemical/chemical industry and attracting investors: European example

- The International Labour Organisation pointed out that there is a lack of skilled workers in the global chemical industry.
- The European Chemical Industry Council identified skills and people as one of the key building blocks of a successful chemical and petrochemical industry.
- About half of the workforce in the European chemical industry has a medium level of education (ISCED 3 or 4, which is upper secondary or post-secondary non-tertiary education).
- Germany, the largest chemicals producer in Europe and the fourth largest producer in the world, has a high share of skilled workers and technicians in its labour force .

Employment in the chemical industry in Germany



Source: CEFIC (2013), "Competitiveness of the EU Chemical Industry, a Key Sector in the Refining Value Chain"; Union of Chemical Industries of Lyon (2015), "Chemistry in Rhone-Alpes"; ILO (2011), *Restructuring, Employment and Social Dialogue in the Chemicals and Pharmaceutical Industries*.

Vocational education and training is important in Europe's chemical industry and particularly in Germany, Europe's largest chemicals market.

Figure 10. The majority of occupations in the United States' basic chemicals industry are technical

Occupation	2003		2006		2009	
	Persons	% of total	Persons	% of total	Persons	% of total
Production	63 400	38.33	62 670	42.78	62 720	41.96
Installation, maintenance and repair	18 180	10.99	16 050	10.96	15 260	10.21
Office and administrative support	15 920	9.63	12 910	8.81	13 120	8.78
Life, physical, and social science	13 050	7.89	11 600	7.92	12 120	8.11
Architecture and engineering	12 580	7.61	8 530	5.82	11 200	7.49
Transportation and material moving	13 370	8.08	11 850	8.09	10 730	7.18
Management	11 860	7.17	9 090	6.21	9 880	6.61
Business and financial operations	5 810	3.51	4 170	2.85	5 560	3.72
Sales and related	3 500	2.12	3 070	2.10	3 130	2.09
Construction and extraction	3 330	2.01	2 920	1.99	1 910	1.28
Computer and mathematical science	2 290	1.38	2 040	1.39	1 800	1.20
Health-care practitioner and technical	620	0.37	370	0.25	770	0.52
Building and grounds cleaning and maintenance	640	0.39	630	0.43	500	0.33
Protective service	440	0.27	350	0.24	550	0.37
Arts, design, entertainment, sports and media	160	0.10	150	0.10	120	0.08
Legal	210	0.13	100	0.07	50	0.03

Source: ILO (2011), *Restructuring, Employment and Social Dialogue in the Chemicals and Pharmaceutical Industries*, American Chemistry Council (2015), "Chemical industry profile", www.americanchemistry.com/Jobs/EconomicStatistics/Industry-Profile, accessed June 2015.

The majority of occupations in the basic chemicals industry in the United States, a leading producer of chemicals, are technical in nature. The two leading occupations made up more than half of all employees in the sector in 2009: production at about 42% of the total; and installation, maintenance and repair specialists at 10% of the total. In 2014, the break-down of occupations in basic chemical manufacturing confirmed the overwhelming need for technical workers. The technical roles that require VET level education made up about 70 % of all occupations in 2014. (US Bureau of Labour Statistics, 2014).

Figure 11. A study by Kazakhstan's United Chemical Company confirmed the technical needs in the chemical industry in Kazakhstan

Specialisation	Number	Percentage
Energy worker	48	0.8%
Electrician	371	6.2%
Instrumentation and control	237	4%
Technical engineering personnel (technicians)	217	3.6%
Technical engineering personnel (safety technology, operational systems, IT etc.)	444	7.4%
Plant operator	1 224	20.5%
Operator	380	6%
Dedicated expert	861	14.4%
Process technician	374	6.3%
Laboratory technician	75	1.3%
Mechanic	1 109	18.5%
Heating/combustion engineer	639	10.7%
Total	5 979	

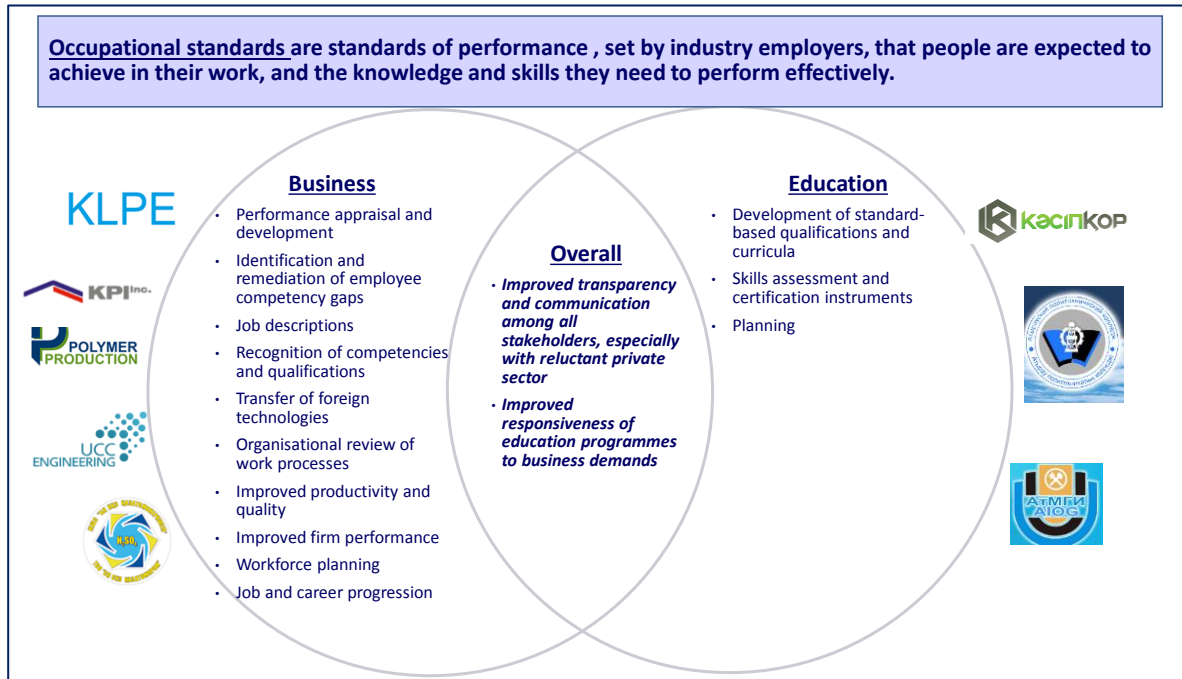
Notes: (1) United Chemical Company – part of the national welfare fund “Samruk Kazyna”, established in 2009 as the main operator of the state Programme for Accelerated Industrial-innovative Development for the chemical industry. It is currently implementing 11 projects in the chemical industry.

Source: United Chemical Company (2015).

Source: United Chemical Company (2015), “Programme concept for the professional preparation of staff for chemical companies”.

All of the identified occupations would benefit from vocational education and training, although not all dedicated experts might need it. Kazakhstan would benefit from a more recent and a more comprehensive study of skills needs in its petrochemical industry to take account of the projects that have been launched.


Figure 12. Occupational standards are key for a well-functioning VET system



Source: CEDEFOP (2009a), *The Dynamics of Qualifications: Defining and Renewing Occupational and Educational Standards*.

Occupational standards have recognised benefits for the overall VET system, as well as additional benefits to businesses and education institutions.

Figure 13. Example of an occupational standard: United Kingdom

COGDO10 Carrying out maintenance within agreed scope of authority in downstream operations																											
																											
Overview This unit is about carrying out maintenance within the scope of your own responsibility and authority. This unit deals with the following: 1 Carry out non-routine maintenance 2 Carry out routine maintenance During this work you must take account of the relevant health and safety requirements and safe working practices. Previous Version: Adapted from Unit 10 of Refinery Operations	COGDO10 Carrying out maintenance within agreed scope of authority in downstream operations Performance criteria You must be able to: <table border="0"> <tr><td>P1</td><td>identify abnormal performance</td></tr> <tr><td>P2</td><td>monitor and record faults</td></tr> <tr><td>P3</td><td>take appropriate corrective action</td></tr> <tr><td>P4</td><td>request help from appropriate persons</td></tr> <tr><td>P5</td><td>obtain all documentation which allows you to carry out the work</td></tr> <tr><td>P6</td><td>ensure that routine maintenance has been carried out</td></tr> <tr><td>P7</td><td>consult written records and relevant personnel</td></tr> <tr><td>P8</td><td>carry out maintenance, using appropriate procedures and schedules</td></tr> <tr><td>P9</td><td>complete all relevant documentation</td></tr> <tr><td>P10</td><td>leave plant and equipment in a safe condition</td></tr> <tr><td>P11</td><td>work safely in accordance with operational requirements</td></tr> </table>	P1	identify abnormal performance	P2	monitor and record faults	P3	take appropriate corrective action	P4	request help from appropriate persons	P5	obtain all documentation which allows you to carry out the work	P6	ensure that routine maintenance has been carried out	P7	consult written records and relevant personnel	P8	carry out maintenance, using appropriate procedures and schedules	P9	complete all relevant documentation	P10	leave plant and equipment in a safe condition	P11	work safely in accordance with operational requirements				
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	COGDO10 Carrying out maintenance within agreed scope of authority in downstream operations Knowledge and understanding You need to know and understand: <table border="0"> <tr><td>K1</td><td>how to select, use and care for PPE (e.g. slings, lifting equipment, gloves, footwear, hard hats, respirators)</td></tr> <tr><td>K2</td><td>the implications of statutory (e.g. HASAWA and COSHH) and organisational requirements</td></tr> <tr><td>K3</td><td>how to interpret operational requirements (e.g. policies, procedures, instructions, codes of practice, standards, schedules)</td></tr> <tr><td>K4</td><td>plant and equipment operating procedures</td></tr> <tr><td>K5</td><td>the types of equipment to be maintained (to include rotating, non-rotating, heat transfer, control)</td></tr> <tr><td>K6</td><td>operating principles of all relevant equipment</td></tr> <tr><td>K7</td><td>how to work with and within the Permit to Work system</td></tr> <tr><td>K8</td><td>why it is necessary to follow site procedures (e.g. use of log books, check sheets)</td></tr> <tr><td>K9</td><td>the importance of using correct work methods and hand tools</td></tr> <tr><td>K10</td><td>the importance of using the correct materials</td></tr> <tr><td>K11</td><td>why relevant personnel have to be informed of equipment status</td></tr> <tr><td>K12</td><td>the limits of your own responsibility and authority</td></tr> <tr><td>K13</td><td>why work has to be carried out under permit control</td></tr> </table>	K1	how to select, use and care for PPE (e.g. slings, lifting equipment, gloves, footwear, hard hats, respirators)	K2	the implications of statutory (e.g. HASAWA and COSHH) and organisational requirements	K3	how to interpret operational requirements (e.g. policies, procedures, instructions, codes of practice, standards, schedules)	K4	plant and equipment operating procedures	K5	the types of equipment to be maintained (to include rotating, non-rotating, heat transfer, control)	K6	operating principles of all relevant equipment	K7	how to work with and within the Permit to Work system	K8	why it is necessary to follow site procedures (e.g. use of log books, check sheets)	K9	the importance of using correct work methods and hand tools	K10	the importance of using the correct materials	K11	why relevant personnel have to be informed of equipment status	K12	the limits of your own responsibility and authority	K13	why work has to be carried out under permit control
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This example of an occupational standard from the United Kingdom concerns the occupation “Carrying out maintenance within agreed scope of authority in downstream operations”. Five components of the standard are illustrated:

- “Title” of the standard
- “Overview” is the introduction to the standard. It describes the contents of the standard and says whom the standard is for and whom it is not for
- “Performance criteria” lists the essential duties that an employee must be able to carry out
- “Knowledge and understanding” lists the essential knowledge and understanding an employee is expected to possess
- Other components are optional: *e.g.* “Scope/Range”, which if included will be part of the occupational standard; “Glossary”, which if included will not be part of the occupational standard; “Links to other occupational standards”, which if included will not be part of the standard.


Figure 14. International good practice: one agency is responsible for maintaining occupational standards

Country	Responsible institution	Description
Australia	The National Standards Skills Council (NSSC) <i>For petrochemistry/chemistry:</i> Manufacturing Skills Australia (Includes Chemical, Hydrocarbons, Refining, Plastics, Rubber)	<ul style="list-style-type: none"> Responsible for developing and maintaining the national standards that regulate the vocational education and training sector for approval by Standing Council on Tertiary Education, Skills and Employment (SCOTESE) Advises SCOTESE of any issues relating to the standards and their implementation
Denmark	The Council for Vocational Training	<ul style="list-style-type: none"> Composed of Danish employer organisations from different branches, the confederation of trade unions and organisations of training providers, VET teachers and students Advises the ministry on overall (not occupation-specific) education standards Trade committees for each sector advise on modifications to already existing occupation-specific education standards
France	<i>Commission nationale de la certification professionnelle (CNCP)</i> <i>For petrochemistry/chemistry:</i> CPC Chimie (Advisory Professional Commission on chemistry, bioindustry and the environment)	<ul style="list-style-type: none"> Manages the national repository of professional certifications ("qualifications"), both public and private Monitors professional diplomas and their correspondence to the actual evolution of qualifications and the organisation of work and makes recommendation to the awarding bodies on possible changes In existence since 2002 One of the members is the Ministry of Education
Germany	Board of the Federal Institute of Vocational Education and Training (BiBB)	<ul style="list-style-type: none"> Consists of employers, trade unions, federal government and state governments Decides on the development of new standards and their modernisation Prepares and launches a National Qualifications Framework on the request of the federal government
Switzerland	Federal Office for Professional Education and Technology (OPET)	<ul style="list-style-type: none"> Ensures quality and strategic planning and development of VET/ PET programmes Issues about 250 VET ordinances
United Kingdom	Sector Skills Councils (SSCs) <i>For petrochemistry/chemistry:</i> Cogent Skills (science-based industries)	<ul style="list-style-type: none"> Develops and maintains OS, works with education and awarding bodies to develop OS-based assessments, training standards, qualifications, and qualification frameworks Licensed by the government to link employer input into the development of programmes and qualifications Bids competitively on an annual basis to develop new national occupational standards and update existing ones
United States	The National Skill Standards Board (NSSB)	<ul style="list-style-type: none"> Encourages and funds voluntary efforts to establish occupational standards The main stakeholders in defined industrial sectors come together and request that the NSSB recognise their partnership to develop standards for that sector

Source: OECD (2014a), *Skills beyond School Synthesis Report*; Céreq (n.d.), *The Role of Sector Skills Councils in England, Netherlands and France*; Manufacturing Skills Australia (2015), "History of MSA", www.mskills.org.au/info/about-us/history-of-msa, accessed February 2015; Australian Skills Quality Authority (n.d.), "How does ASQA regulate?", www.asqa.gov.au/about/how-does-asqa-regulate/how-does-asqa-regulate.html, accessed February 2015; National Standards Skills Council (NSSC), www.ivet.com.au/a/186.html, accessed October 2015; Standing Council on Tertiary Education, Skills and Employment (SCOTESE), www.ivet.com.au/a/182.html, accessed October 2015; Fazekas, M. and S. Field (2013), *A Skills beyond School Review of Switzerland*.

Seven examples of agencies from OECD countries responsible for the development of occupational standards are illustrated. A separate body responsible for sector-specific standards in petrochemistry/chemistry exists in some countries.




Figure 15. International good practice: UK's Cogent skills council for science industries

<p>Mission and activities</p> <ul style="list-style-type: none">• Employer-led, UK-wide organisation, “The voice of the employer”• Formulates and reviews occupational standards• Supports the development of units and qualifications based on these standards• Works with sectoral employers to identify future skills needs• Designs apprenticeship frameworks• Encourages greater employer investment in training• Provides labour market information (LMI) that assists in long-term business planning <p>Sectors represented</p> <ul style="list-style-type: none">• Life sciences (pharmaceuticals, biotechnology, medical technology and consumer healthcare)• Industrial sciences (chemicals, downstream, industrial bio-technology, polymers, advanced materials and formulations)• Nuclear <p>Organisation</p> <ul style="list-style-type: none">• Funding mechanism: 50% employer funding and 50% project funding (which is always a mixture of both, gained by contestable funding)• 90 employees• Represents about 20 000 companies including many SMEs	
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Source: Cogent Skills (n.d.), “About Cogent Skills”, www.cogentskills.com/about-cogent-skills/, accessed June 2015; Cogent Skills (2014), Sector Skills Councils, Rationale and Roles.



The sector skills council for science industries, “Cogent Skills”, is responsible for maintaining occupational standards for chemistry in the United Kingdom. The skills council also gathers labour market information and helps develop units and qualifications based on the standards.

Figure 16. International good practice in forecasting supply and demand of skills (1)

Country	Examples of methods
Australia 	<ul style="list-style-type: none"> • Bureau of Statistics • Commissioning of other companies to do this analysis (<i>e.g.</i> the Industry Council) • The Industry Skills Councils of Australia provide integrated industry intelligence and advice to the Australian Workforce and Productivity Agency, government and enterprises on workforce development and skills needs
Canada 	<ul style="list-style-type: none"> • Sector Councils, which comprise business, labour, education and other key stakeholders, examine current and projected human resource challenges (including how training is developed and delivered), identify solutions, and co-ordinate and implement strategies to help firms to meet changing demands
France 	<ul style="list-style-type: none"> • Commission Paritaire Nationale pour l'Emploi et la Formation Professionnelle (CPNEFP or Joint National Employment and VET Commission, more often called CPNE) has a specific focus on forecasting sectors' trends and on developing training • In 2011, there were 126 registered occupations and skills observatories (OSOs) in France, charged with helping to anticipate the skill requirements of firms and employees and to provide the social partners with information that can be used in developing training policies in individual sectors and industries • Centre for research on education, training and employment (Céreq), under the authority of the French Ministries of Education and Labour. Its studies and statistical surveys on the training-employment relationship are intended to assist the public authorities (notably at the national and regional levels), the occupational branches and the social partners in developing and implementing their policies on vocational and educational training and human resources management



Various types of skills supply and demand analysis are conducted in six OECD countries: Australia, Canada, France, Germany, United Kingdom and the USA.

Figure 17. International good practice in forecasting supply and demand of skills (2)

Country	Examples of methods
Germany 	<ul style="list-style-type: none"> • Federal Institute for Vocational Education and Training (BiBB) does supply and demand analysis and contributes to VET statistics
United Kingdom 	<ul style="list-style-type: none"> • UK Commission for Employment and Skills (UKCES) collects and disseminates information about the UK labour market to assist policy makers and market participants to better match skill supply to skill demand : <ul style="list-style-type: none"> • Conducts the UK Employer Skills Survey (ESS), the country's largest survey of employers' skill needs, utilisation, and investment (and among the world's largest surveys of its kind) • Sector skills councils research supply and demand in specific sectors • The Social and Vital Statistics Division of the Office for National Statistics (ONS) designs, chooses the sample selection and quarterly conducts interviews of the Labour Force Survey (LFS) • An Institute for Employment Studies (IES) produces an initial national and regional LMI assessment
USA 	<ul style="list-style-type: none"> • US Bureau of Labor Statistics produces biennial detailed projections of employment by sector and occupation broken down by state • O*NET is an online database developed by the US Department of Labor offering detailed information on occupations, such as definition and description of the tasks and work activities, knowledge, skills and abilities required, wages and employment trends




Source: National Institute of Labour Studies (2013), *Final Report to the Australian Workforce and Productivity Agency (AWPA) by the National Institute of Labour Studies (NILS)*; Cogent Skills (2011), *Setting Industry Skills and Standards: Annual Report for Petroleum and Petrochemical Industries*; UKCES (2010), *Skills for Jobs: Today and Tomorrow*; Céreq (n.d.), *The Role of Sector Skills Councils in England, Netherlands and France*; D'Agostino A. and A. Delanoë (2012), "Occupations and Skills Observatories: Tools for Shaping the Future", *Training and Employment*, No. 99: pp. 1-4; Commission of the European Communities (2009), *New Skills for New Jobs, Anticipating and Matching Labour Market Skills Needs*.

Figure 18. International good practice in employer-led occupational standards (1)

<ul style="list-style-type: none"> • In most countries, an equal representation of employer and employee organisations is ensured in the development of occupational standards • In almost all countries, private sector involvement is a key element 	
<p>Australia</p> 	<ul style="list-style-type: none"> • Employers have the ability to request occupational standards for new occupations through a continuous improvement register • This means that a new qualification can be developed in as little as 3-4 months and removes the necessity of reviewing each package of qualifications every 18 months – 2 years • Companies are also involved when new qualifications and training packages are formed (voluntary participation), together with Registered Training Organisations (RTOs)
<p>France</p> 	<ul style="list-style-type: none"> • Employers participate in tripartite sector-specific “<i>commissions consultatives</i>” under the Ministry of Education , which usually have 10 employer representatives, 10 representatives of public organisations and 10 representatives of research institutions and meet twice a year to determine need for new qualifications • After a need for a diploma is determined, Working Groups are drawn up which include professionals • Companies cover participation costs and no per diem is given out • Additionally, a number of sector and cross-cutting councils work to match VET to the quantitative and qualitative demands of the labour market

Five OECD countries – Australia, France, Germany, Switzerland and the United Kingdom – are provided as examples of employer engagement in the creation of occupational standards.

Figure 19. International good practice in employer-led occupational standards (2)

<p>Germany</p> 	<ul style="list-style-type: none"> • In co-operation with the Federal Institute for Vocational Education and Training (BiBB), employers develop the qualification structure, the assessment standards, and the standards applying to workplace training. The education standards are developed in parallel by the teachers and experts from the states (<i>länder</i>) • To facilitate their interaction with BiBB, employers created an employers' VET agency (<i>Kuratorium der Deutschen Wirtschaft fuer Berufsbildung</i>) and a VET department at the trade unions' umbrella organisation (<i>Deutscher Gewerkschaftsbund</i>). Employers and trade unions are also on the board of BiBB • Employers and trade unions in Germany have a couple of hundred of experts from the field at hand, at least one or two for each occupational standard, who they can delegate to the BiBB for standard development, evaluation and modernisation • The cost of experts is covered by the companies
<p>Switzerland</p> 	<ul style="list-style-type: none"> • Involvement of professional organisations in VET policy making is stipulated by law • Professional organisations determine the content of ordinances and training plans, as well as national examinations
<p>United Kingdom</p> 	<ul style="list-style-type: none"> • Sector-specific industry-led skills councils oversee development of OS • OS are developed through working groups with heavy participation by the private sector • Methodology for National Occupational Standards (NOS) advises employers to provide input via virtual methods such as online blogging, surveys or discussions on commonly used media such as LinkedIn. • The NOS methodology advises that feedback be captured from employers by tapping into the contacts held by professional bodies, trade unions and trade associations, as well as industry events and conferences

Source: OECD interviews with stakeholders in Kazakhstan 2013-2015; CEDEFOP (2009a), *The Dynamics of Qualifications: Defining and Renewing Occupational and Educational Standards*.

Figure 20. Competency-based curricula and assessment in Australia: training packages



Source: GIZ (2005), *Structures and Functions of Competency-based Education and Training (CBET): a Comparative Perspective*; Mills, J. (n. d.), "Workplace Training in the Agribusiness (agriculture and agro-processing), Australian Case Studies in Vocational Education and Training (VET)".

Australia's Training Packages are a good example of competency-based training, as they provide occupational standards (competency standards), while also setting out titles and details of qualifications and assessment guidelines.

ANNEX B: METHODOLOGY AND PROJECT APPROACH

Within the framework of the OECD Kazakhstan Regional Competitiveness Project, the OECD Eurasia Competitiveness Programme (ECP) and its project partners conducted an assessment of investment attractiveness of Atyrau, one of the project's pilot regions. The findings were presented in the OECD publication *Regional Investment Promotion Strategy in Kazakhstan: Increasing Competitiveness and Attracting FDI in Atyrau* in 2013. The strategy identified the petrochemical and chemical industry as a high-potential sector for investment and identified vocational education and training as a key obstacle to its competitiveness. Several stock-taking missions to Atyrau region allowed the programme to focus in on occupational standards for capacity-building.

Several missions took place in preparation for the peer review of Kazakhstan:

- **1-3 April 2014:** fact-finding mission to Atyrau and a capacity-building seminar on “Improving the VET system in Atyrau through Better Partnerships with Industry”.
- **8-10 July 2014:** capacity-building seminars in Astana and Atyrau on “Vocational training certification: organisation, process and principles for drafting French reference frameworks for training”.
- **21-23 October 2014:** capacity-building workshop in Atyrau on “Developing occupational standards in petrochemistry”.
- **9-11 December 2014:** thematic working session on occupational standards in petrochemistry held in Astana with regional and national representatives.
- **16-19 March 2015:** petrochemistry study mission to France, involving nine Kazakh representatives.
- **29 September 2015 - 2 October 2015:** mission to Astana with two experts for a working group to present draft recommendations.

This publication was submitted for peer review on 26 November 2015 at the third session of the OECD Eurasia Competitiveness Roundtable, a policy network that brings together high-level representatives and technical experts from Eurasia countries, OECD member countries and partner organisations. The Roundtable meets annually and serves as a platform for peer review and knowledge sharing on the implementation of competitiveness reforms.

The peer review is expected to help Kazakhstan define further steps for policy reform implementation. In particular, the Roundtable discussion was facilitated by two experts who provided an overview of the current situation in Kazakhstan and insights into the policy experience of selected OECD members:

- Mr. Kieran Quill, Senior Fellow of the Royal Society of Chemistry (FRSC) and consultant to the UK sector skills council for science industries: “Cogent Skills”.

- Ms. Brigitte Trocmé, Head of the Office for Professional Diplomas, Ministry of National Education, Tertiary Education and Research, France.

Progress towards implementing these recommendations will be discussed in two years' time at the 2017 OECD Eurasia Competitiveness Roundtable.

ANNEX C: BIBLIOGRAPHY

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Strengthening Kazakhstan's Skills in Petrochemistry and Chemistry through Occupational Standards

Kazakhstan has potential for developing its petrochemical and chemical industry in view of its natural resources, proximity to markets and growing internal and external demand. Vocational education and training is essential for building up the petrochemical and chemical industry, a sector which requires complex industrial processes, equipment and working methods, and highly specialised technicians.

This Peer Review Note presents three recommendations and seven actions to strengthen vocational education and training in Kazakhstan's petrochemical and chemical sector. The overall recommendation is to start by creating occupational standards to help meet the industry's demand for skills. These occupational standards should then be used for study programmes and assessments to foster employer engagement and build an effective vocational education and training system in the sector.

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