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National Development Strategy Croatia 2030 Policy Note:

Education and Skills

July 2019

Europska unija
Zajedno do fondova EU

REPUBLIKA HRVATSKA
Ministarstvo regionalnoga razvoja
i fondova Europske unije

EUROPSKI STRUKTURNI
I INVESTICIJSKI FONDOVI

Operativni program
KONKURENTNOST
I KOHEZIJA

Co-financed by the Technical Assistance of the Operational Program “Competitiveness and Cohesion” from the European Regional Development Fund

Acknowledgements

This policy note was prepared in the context of the Reimbursable Advisory Services Agreement "Support for Establishing the System for Strategic Planning and Development Management and for Preparing the 2030 National Development Strategy". The core World Bank team was led by Donato De Rosa (Lead Economist, Team Leader), Josip Funda (Senior Economist, co-Team Leader), and Catalin Pauna (former Team Leader) and included Stanka Crvik Oreskovic (Project Coordinator) and Bogdanka Krtinic (Program Assistant). The team worked under the guidance of Arup Banerji (Country Director), Elisabetta Capannelli (Country Manager) and Gallina Andronova Vincelette (Practice Manager).

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The policy note team thanks the following individuals and organizations in Croatia:

- the Ministry of Regional Development and EU Funds for overall coordination and guidance, especially Ana Odak, the Assistant Minister, and her team;
- the Ministry of Science and Education for meetings and consultations that have informed the policy note;
- the Ministry of Labour and Pension System for meetings and consultations that have informed the policy note.

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1 Overview of Global Trends and Societal Challenges

Over the last decades, countries have made a remarkable effort to get millions of children and youth into schools. Between 2000 and 2014, the number of out-of-school children around the world fell by about 112 million, although exclusions based on poverty, location, gender and ethnicity persist. The recent expansion of schooling in low-income countries is especially remarkable in its scope and speed. Accordingly, the enrollment gaps between low- and high-income countries are closing. Access remains an issue even in high-income countries in certain levels of education, such as early education and care, with access to children under 3 being especially inequitable and uncoordinated. In recent years, however, increasing emphasis has been placed on the quality of education, and above all, on learning outcomes.

Attending school is different from learning. Worldwide, hundreds of millions of children reach young adulthood without attaining even the most basic life skills, despite having attended school for years. Although learning goals are receiving greater rhetorical support, many features of education systems conspire against learning. To realize education's promise, there has been a greater push in developing and developed countries to assess what children learn, to act on what the evidence tells us and to take measures to align actors so that the whole education system works for learners. Many inputs and conditions contribute to learning, but we know that what matters the most is what takes place inside classrooms around the world. For real progress in learning to happen, it is crucial to address technical difficulties and realign political forces so as to ensure teachers are able to teach and students have a stimulating environment in which to learn.

Learning what is relevant – throughout life – is ever more important. The rapid pace of technological development in a globalized world will continue to have a direct impact on the knowledge, skills and abilities that are required of young learners. Solid key competences are indispensable for future learning and a productive life, but in addition to cognitive skills, employers are increasingly demanding socio-emotional competencies from their current and future employees. With the development of 21st-century, labor market-relevant technical and non-technical competences have become imperative to the competitiveness of countries and the well-being of citizens. The Sustainable Development Goals call for countries to ensure inclusive and equitable quality education and promote lifelong learning for all by 2030.[1]

In Europe, the Education and Training (ET) 2020 framework has provided a common agenda around many issues, with the goal of creating a European Education Area by 2025. The European Commission has placed special attention on lifelong learning, quality, efficiency, equity and innovation in education. Goals have been established and recommendations are regularly made by the European Union (EU) Council. Out of seven EU targets for 2020 in education and training, Croatia places below the EU average in six. The exception is the percentage of early leavers from education and training, where Croatia met the EU target from the beginning and is significantly above the EU average.[2] Support mechanisms have been created to assist countries in overcoming common challenges and monitoring

[1] SDG Fund, http://www.sdgfund.org/goal-4-quality-education, accessed October 2018
[2] European Commission, 2018c

takes place on a regular basis. Funding assistance in education and training is also available to many countries, including Croatia. While member states will continue to have the primary responsibility for education policies, the EU's role in this area has been increasing over the last years based on the idea that harnessing the full potential of education is in the interest of all member states.[3] In addition to developing overarching frameworks like ET 2020, the EU also focuses its efforts on creating guidelines and policies on different topics, such as early childhood education, schools, vocational education and training, adult education, higher education, international cooperation and policy dialogue, multilingualism, and education and migrants.[4]

Despite the widespread recognition that education is a priority across the continent, education budgets in many EU countries have been cut in recent years. This includes member states that have been under fiscal consolidation programs, namely Cyprus, Ireland and Portugal. General government expenditure on education as a percentage of GDP in 2015 varied significantly among countries, from 3 percent in Romania to 6.6 percent in Sweden. In 13 out of 28 EU Member States, investment in education and training as a percentage of GDP was lower in 2015 than in 2008. Budget reductions have affected some of the countries that have been hit the hardest by recent international financial crises, such as Greece, Cyprus, Ireland, Portugal, Spain, Italy, Slovenia, Hungary and Romania. Many countries are faced with the need to implement reforms and adjustments in their education systems whilst relying on reduced financial resources.[5]

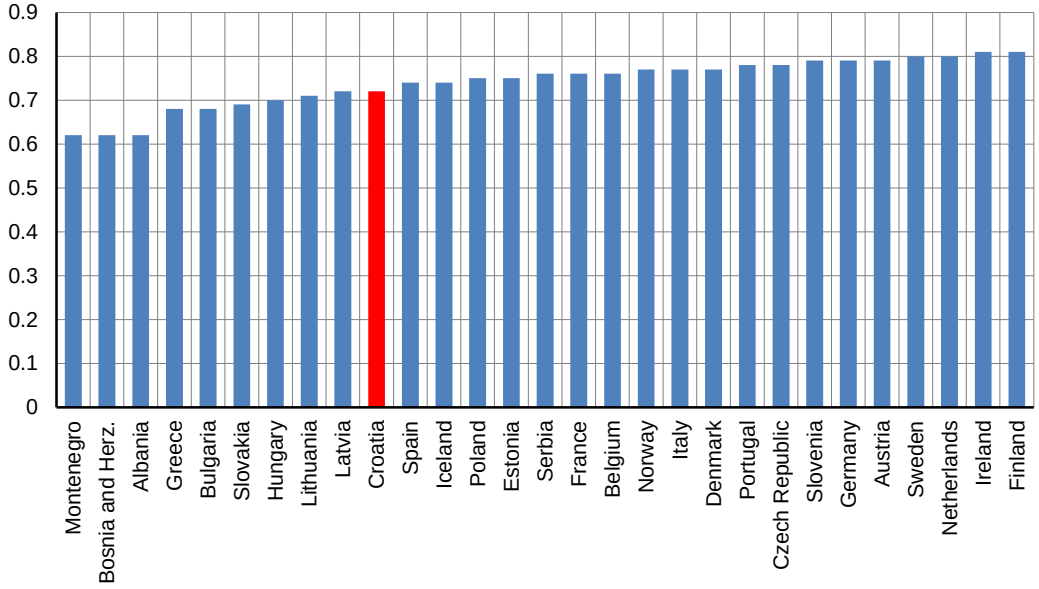
While education outcomes in Europe are often high compared to the rest of the world, inclusion of vulnerable groups remains an important challenge in many European countries. Students from economically disadvantaged families, students whose parents have limited educational experience, and students from ethnic minorities and immigrant families are frequently left behind by education systems, with far-reaching effects in the economy and society. As the largest ethnic minority in Europe, the Roma are especially vulnerable to human rights violations within education. Social marginalization, poverty, language difficulties and cultural differences often prevent them from taking full advantage (in practice) of the education that is in theory legally available to all.[6] In Croatia, rates of participation and learning outcomes of vulnerable groups consistently trail those of the rest of the population at all levels of education.

A child born in Croatia today will be 72 percent as productive when she grows up as she could be if she enjoyed complete education and full health.[7] According to the Human Capital Index, Croatia places 36th out of 157 countries, higher than the average for its region and income group. The Human Capital Index quantifies the contribution of health and education to the productivity of the next generation of workers. Countries can use it to assess how much income they are foregoing because of human capital gaps.[8] Children in Croatia can expect to complete 13.3 years of preprimary, primary and secondary school by age 18. However, when years of schooling are adjusted for quality of learning, this is only equivalent to 10.8 years: a learning gap of 2.5 years. Students in Croatia score 505 on a scale where 625

[3] European Commission, 2018b
[4] European Commission, n.d. (a)
[5] ETUC-CEEP-EFEE-ETUCE project report
[6] Council of Europe, n.d.
[7] World Bank, October 2018b. Retrieved from http://databank.worldbank.org/data/download/hci/HCI_2pager_HRV.pdf
The HCI measures the amount of human capital that a child born today can expect to attain by age 18. It conveys the productivity of the next generation of workers compared to a benchmark of complete education and full health. It is constructed for 157 countries. It is made up of five indicators: the probability of survival to age five, a child's expected years of schooling, harmonized test scores as a measure of quality of learning, adult survival rate (fraction of 15-year olds that will survive to age 60), and the proportion of children who are not stunted.
[8] World Bank, 2018c.

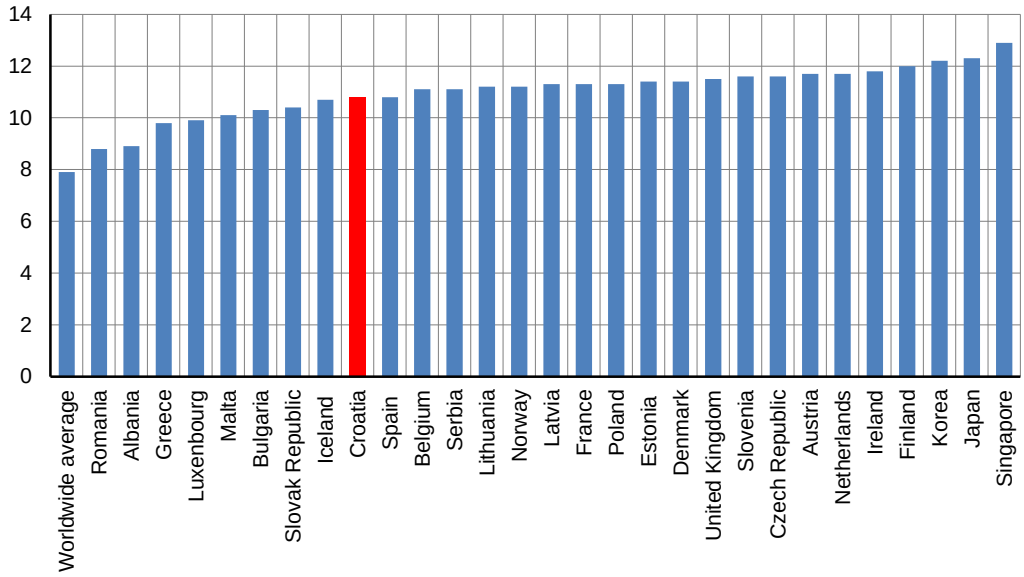
represents advanced attainment and 300 represents minimum attainment.

Figure 1: Human Capital Index 2018



Source: World Bank, 2018c

Figure 2: 2018 Human Capital Index – Learning-adjusted years of school for select countries



Source: World Bank, 2018c

Similar to other EU countries, Croatia has started a comprehensive curricular reform, but its implementation has been riddled with challenges, although some progress has been made recently. Following the adoption of the Strategy for Education, Science and Research in 2014, improving education quality through the curricular reform became one of the main objectives for the primary and secondary education sector, with implications also for VET. Nevertheless, lack of clarity on the budget and on the timeline for implementation of the reform quickly became a problem. In the 2018/2019 academic year a pilot of the reform was finally launched, with broader implementation expected to take place next

year. However, no action plan for implementation of the reform has been developed and approved. Teacher preparation to implement reform-related changes in piloting schools has been limited and often inadequate. Training of all teachers has recently started. Three years after the reform was launched, most teachers still organize their teaching according to the National Curriculum Framework (2010), which provides basic guidelines but no subject-specific curricula, and to the National Plan and Program for Primary Education (2006), which is mostly content-related and does not adequately answer the needs of a competence-based approach to education. The introduction of a system for recognizing and validating non-formal and informal learning is also pending. Following a period of uncertainty tied to the level of commitment to the reform that led the Council of European Union to issue country-specific recommendations in 2017 and 2018 for Croatia to accelerate[9] and deliver[10] on the reform, expectations that the reform will finally takeoff have increased.

[9] European Commission, 2017a
[10] European Commission, 2018 a

2 Overview of Developments in Croatia

In recent years, Croatia has initiated a number of important education reforms. These include the development and implementation of a national curriculum framework in early childhood education and care (ECEC), as well as in primary and secondary education, the implementation of a State exam that serves as a secondary school-leaving/university-entering assessment, and the introduction of performance-based financing in higher education (HE). Returns to schooling remain high and above the regional average, with higher returns to females than males. However, key challenges and structural issues remain in the different levels of education in Croatia. While learning outcomes as assessed by international tests are above average at the primary education level (4th grade), they are lower for students in the beginning of secondary education. The education system also faces pressure from the effects of rapid population aging and the shrinking of school-age cohorts, high levels (though on the decline) of youth unemployment and an outflow of talent. The number of primary school students in Croatia declined by 15 percent and the number of secondary school students dropped by 12 percent from 2007/2008 to 2016/2017.[11] Youth unemployment (15-24 years of age) was 27 percent in 2017. In the same year Croatia reported a negative net migration of 31,799 people.[12] These trends have an impact on educational planning, teacher education, school infrastructure (e.g. closing down of schools) and continuity of different programs, especially in upper secondary education. In this context, equipping and re-equipping Croatian children, youth and adults with the right competencies to lead highly productive lives has become even more central to the country's development.

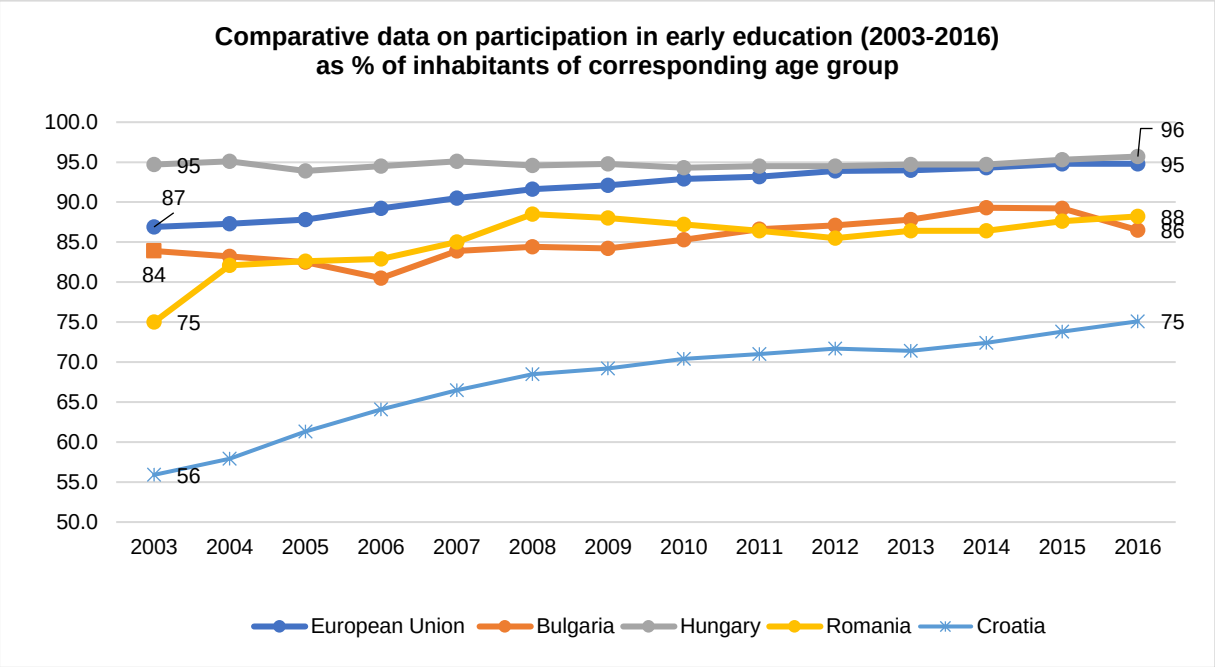
While the RDI is widely considered as the key to economic development, the Croatian RDI sector still lags behind the EU average when measured through most of the common RDI indicators. Croatia is the only new EU member from Central and Eastern Europe whose gross domestic expenditure on research and development (GERD) in relation to GDP was lower in 2016 than in 2002 (Eurostat, 2017). GERD in Croatia in 2016 amounted to EUR 392.30 million or 0.84% of GDP, considerably below the EU average of 2.03% of GDP, and far from the National target of 1.4% of GDP. It is concerning that business sector expenditures on R&D in 2016 amounted to 0.38 % of GDP, which is the same as they were in 2001. In 2016 the business sector spent EUR 176.18 million on R&D which, when converted, means that companies in Croatia invest 42 EUR per capita on R&D, which is nine times less than the EU average (EUR 385.4 per capita). The strategic framework of the research sector in Croatia, as defined by the relevant national and EU strategic documents, is focused towards several main directions: increasing the investments into RDI activities, education system reform, development of science-industry collaboration, and improving the visibility and competitiveness of the Croatian research sector at the European and international level.

[11] Croatian Bureau of Statistics, 2017. Statistical yearbook 2017. pp. 487 Retrieved from: https://www.dzs.hr/
[12] Croatian Bureau of Statistics, 2017. Migration of population of republic of Croatia, 2017 First release number: 7.1.2. https://www.dzs.hr/Hrv_Eng/publication/2018/07-01-02_01_2018.htm

2.1 Early Childhood Education and Care: Croatia lags behind the EU in access to ECEC and inequity is a concern

Croatia has made important improvements in access to quality Early Childhood Education and Care in the last decade, but a high number of young children still do not participate in early learning programs. In 2016, 75.1 percent of Croatian children 4 to 6 years of age attended ECEC programs, the lowest percentage in the EU, which has an average enrollment rate of 95.5 percent.[13] Participation in ECEC by children 6 months to 3 years of age was significantly lower, at 56 percent for 3-year-olds, 38 percent for 2-year-olds and 11 percent for children under two in 2016.[14] When contrasted with the EU target for 2020 and Croatia's own 2014 Strategy for Education, Science and Technology goal of having 95 percent of 4-6 year-olds enrolled in ECEC, the country's progress in this area raises concerns. While ECEC participation in Croatia has grown at a faster pace than some peer countries in the last fifteen years, this increase has been too modest for the country to catch up to its neighbors. Croatia is unlikely to meet the EU2020 goal for enrollment in ECEC.

Figure 3: Participation in ECEC over time - Croatia, EU and select peer countries



Source: World Bank staff calculations based on Eurostat 2018 data

High inequity in access to ECEC opportunities, based on geographical, socio-economic and minority status, is a problem.[15] Children from underdeveloped regions, rural areas, poor families and the national minority face the greatest barriers to access. Safeguarding children against developmental risks requires a multisectoral approach, advanced by policies that promote coordination, cooperation

[13] European Commission, 2018c
[14] Eurostat, 2018a
[15] Bouillet, 2018

and integration of services on the municipal or regional level, in different professional sectors, including education.[16] In Croatia, in these situations, inequalities are being amplified by access or lack of access to education. Access to ECEC among different counties in 2016 ranged from 6 to 40 percent for children ages 0-3 and from 24 to 83 percent for children ages 4-6.[17] According to the European Commission, many small local units lack adequate financial and administrative capacity to carry out decentralized functions. The territorial fragmentation of Croatia's public administration and differences in levels of administrative capacity and financial resources hinder the design and implementation of public policies broadly[18] and of ECEC expansion and availability in particular. Croatia's funding model – 99 percent of ECEC costs are decentralized to the municipality level – is viewed as the primary obstacle to increasing ECEC coverage in the country.[19] While the number of ECEC units, including kindergartens, has increased consistently over the last decade, going from 1288 in 2006/2007 to 1715 in 2017/2018,[20] underdeveloped units of local government added new kindergartens at a slower pace than their wealthier counterparts.[21] The rate of increases in ECEC participation also varies significantly among regions. While national participation in the 0-2 age group increased by 6.8 percent in the 10-year period between 2006 and 2016, in Slavonia this increase was only 2.6 percent (in the context of Slavonia's participation rate of 8 percent in 2016 vs. a national rate of 21 percent).[22] While ECEC benefits are greater for children of disadvantaged backgrounds (such as those coming from poor families and Roma children), availability of ECEC institutions and cost of attendance represent particularly important obstacles to these same groups of children. Only 48 percent of 6-year-old Roma children were covered by some form of preschool education in 2014.[23]

Systemic bias against the most vulnerable groups, including the prioritization of enrollment for children of employed parents, aggravates disparities in ECEC.[24] Criteria for enrollment are defined at the local level following a set of legal requirements, so variation across and even within towns and municipalities (e.g., public vs. private kindergartens) is significant. One of the most common criteria used, however, is the prioritization of children from families in which both parents are employed, which puts children of parents out of employment at a disadvantage. The results of another recent study showed the importance of ECEC participation in later learning, which further impairs children without access to pre-primary education: Croatian students who attended pre-primary education achieved statistically higher results in the Math and Science assessments of TIMSS 2015 when compared to 4th grade students who did not attend pre-primary education.[25] This finding is corroborated by 2015 PISA data which shows, as in previous editions of PISA, that in practically all OECD countries – and in Croatia as well – 15-year-old students who had attended ECEC settings outperformed students who had not. The PISA 2015 data also shows that the higher the number of years spent on early childhood education, the lower

[16] Leseman, 2002s
[17] Dobrotic, Matkovic and Menger, 2018
[18] European Commission, 2018a
[19] European Commission, 2018c
[20] Croatian Bureau of Statistics, Statistical Yearbook of the Republic of Croatia, 2017
[21] European Commission 2017b
[22] CBS data based on DV-PO form
[23] Operational Programme Under the Investment for Growth and Jobs Goal
[24] Bouillet, 2018
[25] Antulić and Buljan Culej, J, 2017

the chances a student had of being among low performers in PISA.[26] According to PISA data, participation in ECEC in Croatia is closely associated with economic, social and cultural status (ESCS), as shown on table 1. Likewise, 2015 PISA results showed that children whose parents completed higher levels of education also enrolled in ECEC in higher numbers and for longer periods of time (e.g. 77 percent of the children of tertiary-educated parents had enrolled in kindergarten for an average 3 years, while only 40 percent of children whose parents had completed 3-year VET programs had enrolled in kindergarten, for an average of 2.2 years)[27], highlighting discrepancies in coverage associated with parental education, which often correlates with socio-economic status (SES).[28]

Table 1: Participation of Croatian PISA 2015-takers in ECEC per economic, social and cultural status (ESCS)

ESCS quintile	Kindergarten	Nursery	Average duration of attendance in years
Lowest (1)	34%	10%	2.1
2	50%	17%	2.4
3	54%	23%	2.6
4	68%	30%	2.7
Highest (5)	82%	36%	3.1
Total	58%	23%	2.7

Source: World Bank calculations based on OECD PISA 2015 data

Croatia has a strong model of teacher training, but teacher shortages at the pre-primary level need to be addressed to allow for the system's expansion. Initial teacher preparation and opportunities for professional development are viewed as strengths of the Croatian ECEC system. Out of 12,142 kindergarten teachers and teachers employed in kindergartens in 2017/2018, 88 percent had a bachelor's degree (a requirement for the profession), and approximately 7 percent had a master's degree.[29] However, as large number of ECEC teachers are projected to retire in the coming years and the country's need to expand ECEC will become more evident, and it will become necessary to adopt a teacher replacement and growth strategy. An increasing number of teachers and support professionals such as psychologists, special education teachers (rehabilitators, speech therapists), pedagogues, and medical staff, among others, will be needed in areas where new kindergartens are expected to open, which often are in rural, less developed regions. The shortage seems to be particularly accentuated for rehabilitators and speech therapists, especially in smaller, rural regions.[30] The success with which the government can train and hire new professionals where they are needed in a timely manner will be crucial to increasing the number of children enrolled in ECEC.

Decentralization – and to some extent fragmentation – of the ECEC system in Croatia comes with its share of challenges. While decision making at the local level has a series of advantages, financing for ECEC being exclusively set at the local level without transfers from the central level, and the nonexistence of a guarantee of placement for children in ECEC (legal right to ECEC) challenges the

[26] OECD, 2017. Starting Strong 2017. Retrieved from https://read.oecd-ilibrary.org/education/starting-strong-2017_9789264276116-en#page148
[27] World Bank calculations based on OECD data
[28] World Bank staff calculations
[29] Croatian Bureau of Statistics Report from May 2018, First Release, number 8.1.8
[30] Bouillet, 2017

equity and efficiency of the system, as well as the national government's ability to implement strategic reforms. In Croatian pre-primary education, the lack of standardization in the enrollment criteria, the variation in fees charged to families and differences in subsidizing private vs. public kindergartens, the variation in ECEC availability and in salaries of ECEC staff across counties, and missed opportunities to more strategically use resources (such as EU funds), are all exacerbated by the high number of small local government bodies involved in basic decision-making on planning, funding and delivery. While decision-making capacity at the local level is key to the design of solutions that address needs that vary by region, stronger guidelines from the national government on key issues can raise the overall equity and quality of ECEC in the country. Various experiences around the world also show that decentralization needs to be accompanied by well-targeted funding from the central government to local governments in order to address disparities that usually develop among wealthier urban and relatively poorer rural regions.

2.2 Primary and Secondary Education: Attainment rates are high, but nearly half of the poorest students are functionally innumerate

Croatia's spending on education as a percentage of GDP and as a share of total government expenditure is on par with the EU average. At 4.8 percent in 2016, the country's expenditure on education as a share of GDP compares with the EU average of 4.7 percent. Both Croatia's share of total government expenditure in education and the EU average in 2016 were 10.2 percent and have remained stable for the last few years.[31]

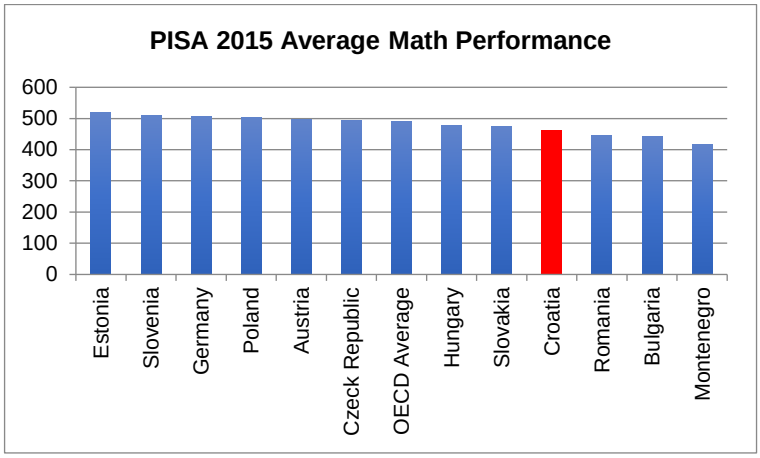
The performance of Croatian 4th grade students in Math and Science is comparable or higher than the EU average. Over the last four years, the performance of Croatian students on the Trends in Mathematics and Science Study (TIMSS) improved significantly, from 490 in 2011 to 502 in 2015. Results in Math place Croatian 4th graders just above the TIMSS' average, while Croatia's average in Science compares even more favorably to the EU average (533 vs. 500). Boys outperform girls by 8 points in Math and by 2 points in Science.

On the other hand, the performance of Croatian 15-year-olds in the Programme for International Student Assessment (PISA) raises concerns, in 2015, 32 percent were considered low performers in Math, nearly 25 percent in Science and 20 percent in reading. While TIMSS measures content knowledge in connection with the curriculum, PISA measures students' skills and competencies. Given Croatia's plan to move towards a competency-based curriculum, the PISA results are particularly concerning. The share of low-achieving Croatian students in all three subjects of PISA has been persistently high over time and is above the EU goal of 15 percent by 2020. The situation is particularly serious in Math and Science. Only a small percentage of Croatian students scored high performance levels on the test. In 2015 boys performed, statistically, significantly better than girls in Science, while girls outperformed boys in reading. Since 2006, Croatian students' results in Math have been concerning but stable, while they declined in science and improved in reading. Croatia's results in Math, reading and science are all below the OECD average.[32]

[31] European Commission, 2018d

[32] While Croatia is not part of the OECD, the comparison with OECD countries can be a useful benchmark for PISA and is common given that PISA is an OECD initiative.

Figure 4: Average Math Scores of Select European countries, 2015



Source: OECD 2015-2016

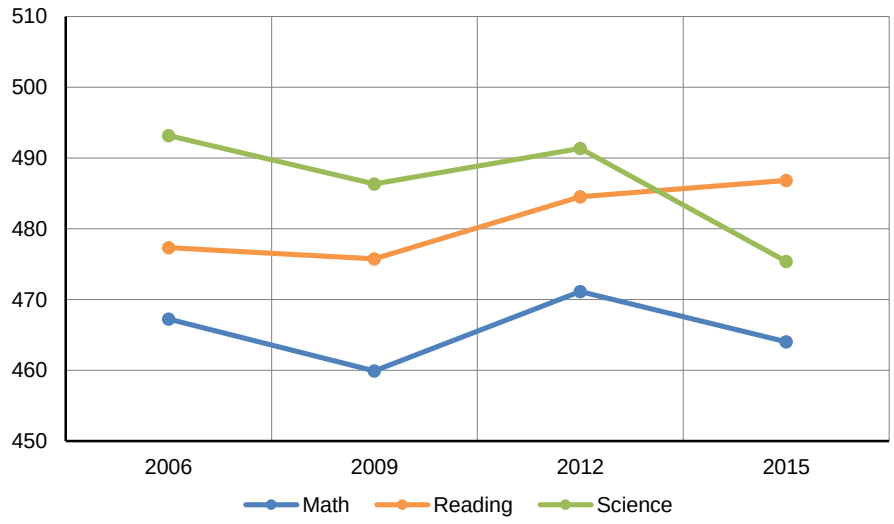
After accounting for students' results in Math, reading and science, the performance of Croatian students in collaborative problem solving is one of the lowest among PISA-participating countries and economies.[33] Croatia placed 43 out of 50 in this aspect of PISA 2015. Although Eastern Europe and Central Asia (ECA) countries perform strongly on international assessments that measure students at the primary level (grade 4), their performance is weaker on assessments of students around the end of lower secondary education (~grade 8). These results suggest that in general, ECA education systems are adept at imparting basic skills, but have problems imparting higher order skills such as problem-solving —the key skills that firms increasingly seek.[34]

[33] OECD, n.d. Accessed October 2018: http://gpseducation.oecd.org/CountryProfile?plotter=h5&primaryCountry=HRV&treshold=10&topic=PI

[34] World Bank, 2012

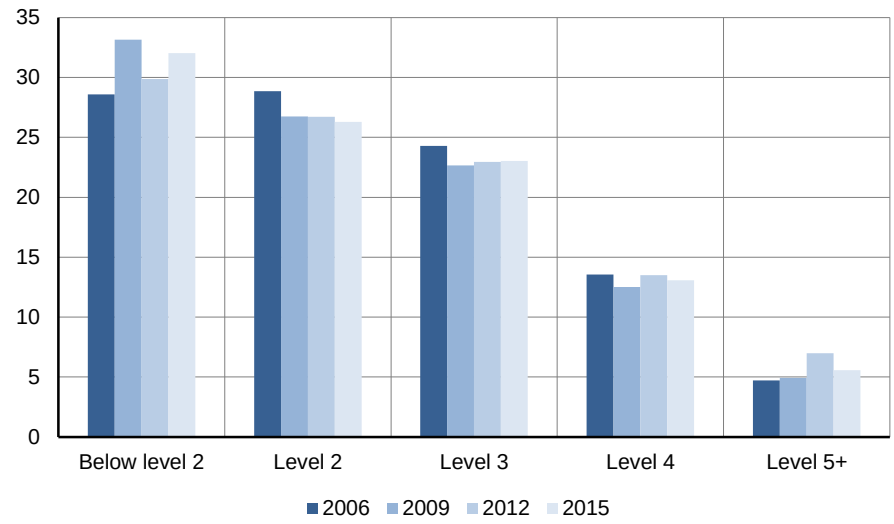
1.1

Figure 5: Croatia's PISA scores by subject (2006-2015)



Source: World Bank staff calculations

Figure 6: Croatian students' level of PISA performance in Math over time

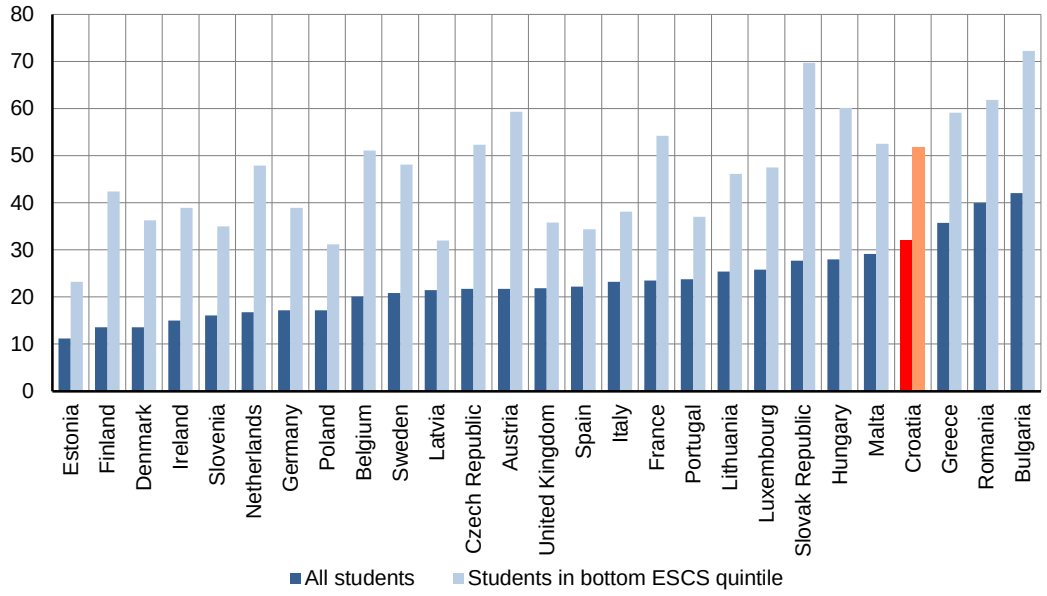


Source: World Bank staff calculations

PISA 2015 results indicate high levels of inequality in education outcomes in Croatia. Nearly 45 percent of pupils from the lowest socioeconomic quartile fail to achieve the basic level of proficiency in Math, compared to only 15 percent from the top quartile. A similar performance gap is seen in science and reading skills. The PISA Math results show that a large proportion of Croatian students are "functionally innumerate" compared to many of their EU neighbors. More troubling, more than half of the students in the lowest performance group are from the lowest socio-economic quintile and end up falling further behind in numeracy skills. In general, wealthier students attend general education schools (gymnasiums) that perform better in PISA, with students from lower socio-economic status overly represented in 4- and 3-year VET schools, which often perform at the bottom of the PISA scale. More than 87 percent of Croatian students in the lowest economic, social and cultural status (ESCS) quintile, according to PISA, were enrolled in VET programs (52.5 percent in 4-year and 34.6 in 3-year VET tracks), while only 12.9 percent attended general upper secondary education. In comparison, among students in the highest ESCS quintile, only 33.7 percent were enrolled in VET programs (29 percent in 4-year and

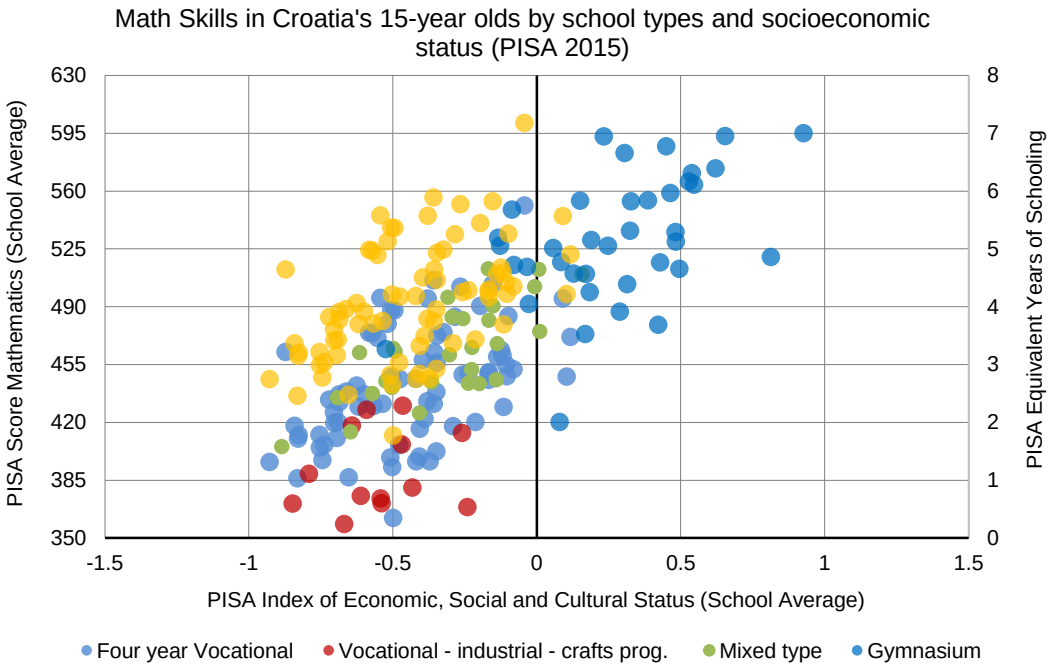
4.7 percent in 3-year programs), while the majority – 66.3 percent – attend gymnasiums.[35] Most of the variation in PISA scores, however, comes from variation within schools.

Figure 7: Low performers in Math by socio-economic status



Source: World Bank, 2018 - Growing United: Upgrading Europe's Convergence Machine

Figure 8: Croatia's PISA performance in Math by school type and socio-economic status

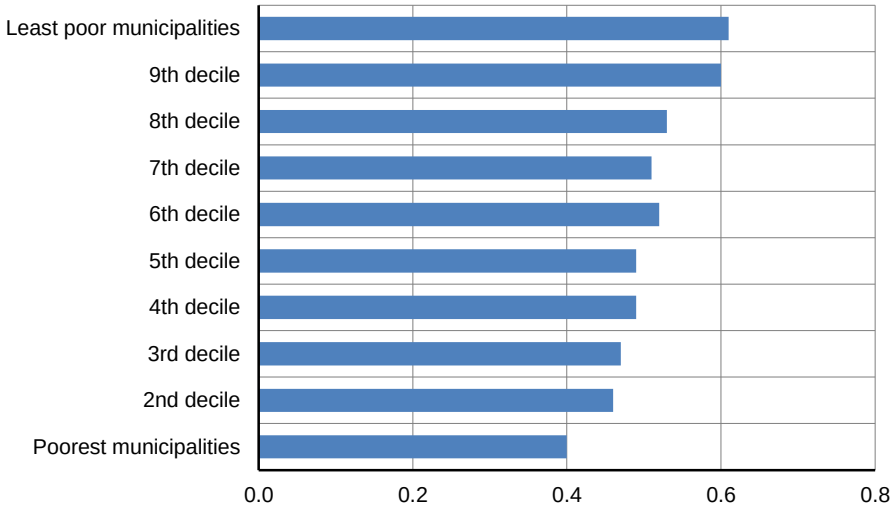


Source: World Bank staff calculations

[35] World Bank calculations based on OECD PISA 2015 data

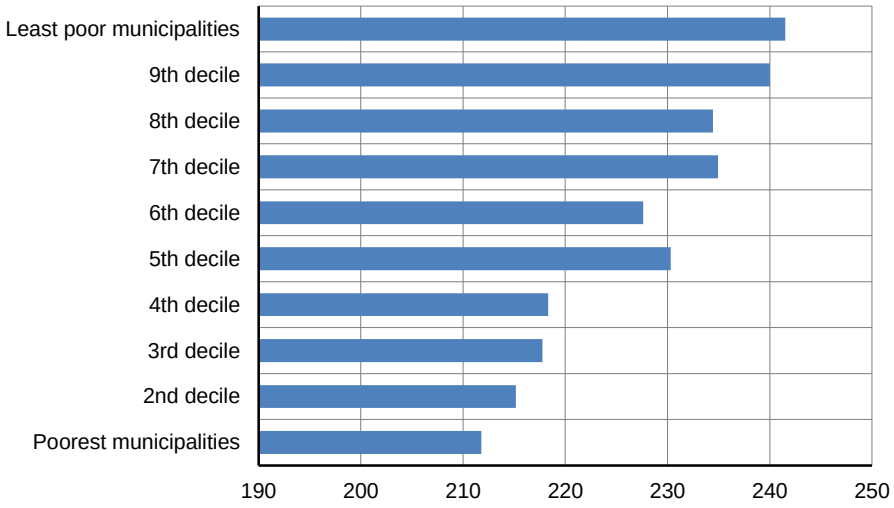
Students living in the poorest municipalities are also at a disadvantage in the Matura exam. The percentage of students taking the Matura exam (2009) goes down proportionately to municipality wealth levels. While in the least poor municipality more than 60 percent of students sat for the Matura in 2009, in the poorest municipality only approximately 40 percent of students did so. Average scores were also closely correlated with municipality wealth. Likewise, students from the poorest municipalities were more likely to fail the Matura than their counterparts in wealthier areas of the country.[36]

Figure 9: Percentage of students taking the Matura exam per decile of municipality wealth, 2009



Source: World Bank calculations

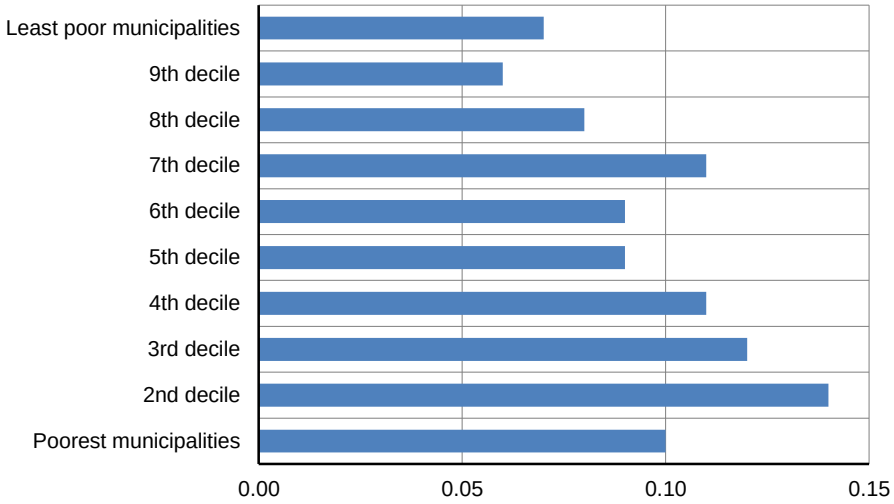
Figure 10: Average scores at Matura exam per decile of municipality wealth, 2009



Source: World Bank calculations

[36] World Bank, 2018 (using 2009 data)

Figure 11: Percentage of students failing the Matura exam per decile of municipality wealth, 2009



Source: World Bank calculations

Croatia has one of the lowest shares of early leavers from education and training in the EU, as well as a relatively small percentage of grade repeaters. In 2017, 3.1 percent of the population aged 18-24 in Croatia, compared with 10.6 percent on average in the EU, left education and training early.[37] However, the gap for early school-leavers between students with and without disabilities in Croatia is one of the largest in the EU (14 percent compared to the EU average of 10 percent in 2015), which raises concerns and should be addressed. A significantly smaller percentage of Croatian students – 1.6 percent – repeated a grade in 2015 compared to the EU average repetition rate of 12 percent.

The Government recognizes the need for improving education outcomes and has launched a curriculum reform pilot as a first step to achieve this goal. In primary and secondary education, a new curriculum – involving increased focus on modern teaching practices and building problem-solving skills in students – is being piloted during the 2018/19 school year before being rolled-out at the national level. A sample of 74 schools has been included in the experimental phase of the curricular reform. These schools were selected based on the assumption that 5% of the schools (out of a total of 1311 central schools) should be sufficient to obtain answers to the important questions relevant to this experimental pilot reform. This, in turn, required a selection among all types of schools (primary schools, general education secondary schools, and vocational secondary schools) in all counties, but also in different surroundings (rural and urban, islands and similar), as well as schools of different sizes and with different digital maturity. The selection was not random; rather, the schools were required to apply to the public call, accompanied by approvals from the school founders, school boards, teachers' councils and parents' councils, as well as a motivational letter. The approvals were of crucial importance for determining the right to participate in the experimental implementation of the reform. The preparation of teachers, school support staff and school principals was carried out targeting these 74 schools specifically. The teachers from other schools were also able to voluntarily join the virtual classrooms, and several thousand teachers used that opportunity.

The Strategy for Education, Science and Technology as well as numerous EU programming documents have served as sources for setting the objectives of the curricular reform. Three main

[37] Eurostat, 2018b.

goals guide the reform: 1) an approach based on educational outcomes aiming at problem-solving and critical thinking in subject curricula as well as in 7 cross-subject topics; 2) an inclusive and motivating environment for studying, leading to more relevant content and creative students and 3) motivated teachers who accept and use their competences (knowledge, skills, autonomy and responsibility) in order to respond in an innovative manner to the challenges of 21st century schooling, particularly concerning lifelong learning.

The Croatian government has recently made significant investments in schools' teaching and learning environment. In a period of one year (December 2017 – December 2018), the Ministry of Science and Education invested approximately HRK 105 million (equivalent to EUR 14.1 million) in school equipment (HRK 45 million in IT equipment, HRK 15 million in didactic equipment and special equipment for natural sciences, HRK 30 million in the purchase of books and other materials for the schools participating in the curriculum reform pilot, HRK 5.25 million in books for school libraries, HRK 10 million in other expenses), and in the course of 2019 it is expected to invest approximately HRK 150 million (equivalent to EUR 20.2 million) in all schools in Croatia. Through its e-Schools project, the government is making significant investments into the digital transformation of Croatian schools. In the first phase of the e-Schools project, which receives funding from the EU, a pilot in 151 pilot schools was conducted, and an investment of HRK 306.8 million (equivalent to EUR 41.4 million) was made into the school network infrastructure, equipping classrooms and teachers, developing applications for teaching and administration as well as training the teachers and developing digital learning materials. The second phase of the project (September 2018 – December 2022) involves rolling out the program to all Croatian schools and investing HRK 1.3 billion (equivalent to EUR 177 million) into the comprehensive digitalization and digital transformation of the primary and secondary education system in Croatia.

2.3 VET, Adult Education and Lifelong Learning: Participation in VET is high, but graduates face high unemployment

Participation in Croatia's VET programs is one of the highest in the EU. In 2014, 71 percent of upper secondary students in the country were enrolled in initial VET programs, compared to the EU average of 47 percent in the same year. Of these approximately 140,000 VET students in 2014, 66 percent were enrolled in four-year programs,[38] 32 percent in 3-year programs and 1.6 percent in programs for students with disabilities or in smaller 2 or 1-year programs.[39] A significant number of VET students, primarily those in the longer programs, goes on to higher education: in the period between 2010/2011 and 2013/2014, approximately 78 percent 4-year VET students per year passed the state Matura exams required to access higher education, and 61 percent actually enrolled in higher education programs.

VET graduates face lower wages and high unemployment prospects. The latest available data

[38] Or in the one five-year program in the health field
[39] Ministry of Science, Education and Sports, 2014

(2012) shows that returns to schooling in Croatia are higher in higher education than in secondary education.[40] Compensation increases with the level of education attained. Higher education graduates command significantly higher salaries than graduates with only secondary school degrees: in 2015, the average net wage was 8316 kn for university graduates, 4780 kn for upper secondary graduates with a 4-year degree and 4353 kn for upper secondary graduates with a 3-year degree (in comparison, unskilled workers earned an average of 3528 kn).[41] A high percentage of unemployed Croatians have completed secondary education, especially VET programs. According to the Croatian Employment Service, in the 2010-2015 period, on average 58 percent of those registered as unemployed had that specific profile. In 2017, Croatia's employment rate of recent VET graduates (1-3 years after completing education) was 58 percent, an improvement since 2014-2015 levels but lower than the previous year and significantly below the EU average of 75 percent.[42] VET students also perform worse than general education students in PISA, with learning outcomes worsening from 4 to 3-year VET students, pointing out to the possibility that the whole VET education system might be holding back the performance of the overall education system.

Table 2: PISA 2015 performance by upper secondary program of study

	Math	Reading	Science
General education	528	556	541
4-year VET	455	481	469
3-year VET - Trades	394	402	398
3-year VET- Crafts	388	394	392

Source: OECD, 2015

Despite important improvements in the framework of the Croatian VET in recent years, the mismatch in the supply and demand for skills remains a top concern. The establishment of the Croatian Qualifications Framework (CROQF) and the strengthening of mechanisms to improve the quality of the system and its linkage to the labor market, such as Sector Skills Councils, Sector Profiles, occupational and qualifications standards, were important steps in the modernization of Croatian VET. Nevertheless, many of these changes are yet to trickle down to schools and students, which remain dependent on outdated curricula and the teachers continue to be disconnected from the labor market. A lack of regular studies focused on labor market forecasting and the employment outcomes of VET graduates, such as skills anticipation surveys and tracer studies, as well as the limited use of existing data, aggravate the gap between the demand and supply of skills; these need to be addressed by the government, which has started a reform of the VET system as part of its broader effort to revamp the quality of Croatian education. As part of the 2016-2020 VET Program, important developments have taken place recently, such as the adoption of the national curriculum for vocational education, and the implementation of 19 vocational curricula, development of the dual-learning model, the decision to implement 25 regional centers of competence in priority sectors, development of a tool (EQAVET) that recognizes competences related to WBL, development of guidelines for a more rational and effective network of VET schools, and launch of a program based on skills competitions to promote VET and try to increase its prestige, as well as the creation of a program aiming to improve the competencies of VET teachers.

[40] Montenegro and Patrinos, 2014
[41] Croatia Bureau of Statistics, Employment and Wages statistical reports (various years). Table 3.2
[42] Eurostat, updated 04/20/2018

However, a significant amount of work still needs to be done in order to more closely connect the supply and demand for VET skills. Long school-to-work transitions and the need to increase foreign work quotas in certain sectors are additional reminders of the mismatch of skills in Croatia.

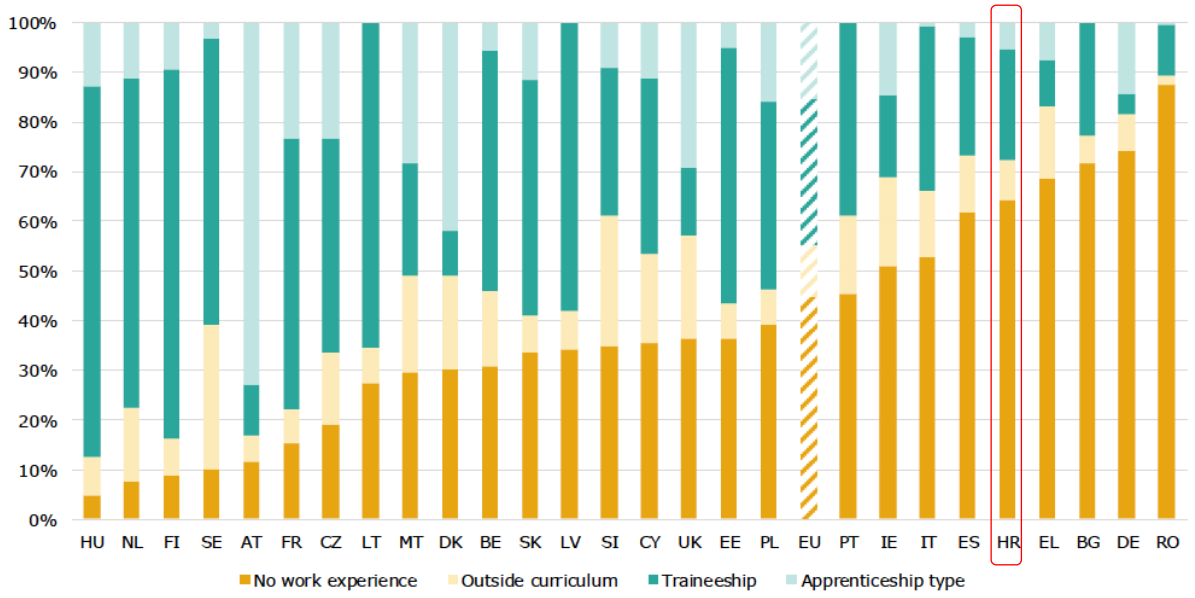
In Croatia, issues of skilling and re-skilling[43] of the workforce are crucial to improve labor market outcomes. Following a six-year recession, positive economic trends that started in 2015 have continued through 2018 and are expected to last for the next few years. GDP grew by 2.6 percent while the annual unemployment rate fell by 2.8 percentage points to 8.4 percent in 2018,[44] hitting its lowest levels in several years.[45] While employment is expected to experience moderate growth, only modest growth in productivity is forecast for the next three years.[46] According to the European Commission, overall there has been little progress in implementing policy measures to address the chronically low labor utilization and slow productivity growth.[47] Productivity is affected by training and the level of skills across the population; raising productivity is ultimately essential for maintaining living standards in aging societies where fewer people will be working.[48] Croatia's relatively low levels of productivity and low labor force participation can be at least in part attributed to the skills level of its population. Low productivity and under-skilled issues are further exacerbated by Croatia's high net emigration rate, creating complications of brain drain. The country's lagging regions are typically the most affected by the cycle of low skills, low productivity, low wages and high emigration. Those regions stand to gain significantly by improvements in the quality of the VET and adult education system.[49] When the majority of upper secondary students are enrolled in VET programs, changes to the VET system have the potential to improve the performance of the overall education system. Better learning outcomes for Croatian students are necessarily connected to improvements to the VET system. On the other hand, policies are needed to encourage strategic adjustments in terms of meaningful job creation (e.g. in the tourism sector, where sometimes the reservation wages are those paid in Austria, it might make sense to encourage the development of higher end (5-star instead of 3-star) hotels and activities).

Engaging employers to better understand labor market requirements and trends and to offer students adequate opportunities for work-based learning (WBL) continues to be a challenge. Over the last five years, securing WBL placements for students has become more difficult, with many schools and programs resorting to hands-on training in their premises instead of in employer locations, at least in part due to more stringent training requirements for workplace mentors. More than 60 percent of Croatian VET students gain no work experience during their studies.[50] At the same time, lack of experience is cited as the second most important reason for labor shortages faced by Croatian employers, after lack of suitable education/specialization.[51] On-the-job training is also very limited in Croatia. While incentive mechanisms exist to encourage employers to train their employees (e.g., tax incentives), they have proven ineffective, especially among micro and small and medium enterprises (MSMEs). In 2015,

[43] This paper uses the "skills" terminology commonly adopted worldwide in this sector to refer to the broader concept of competencies, which includes skills but also encompasses knowledge and abilities
[44] Croatian Employment Service, 2018
[45] Labor Force Survey, 2018
[46] Government of the Republic of Croatia, 2018
[47] European Commission, 2018a
[48] World Bank, 2012
[49] World Bank, 2018a
[50] European Commission, 2018c
[51] Croatian Employment Services

Croatia ranked 23rd in the EU in terms of the percentage of employers providing training to their employees. Four-fifths of employers that did not offer training have stated that existing qualifications, skills and competences of the workforce correspond to the current needs of their enterprise.[52]

Figure 12: Work experience during studies in VET (15-34 years), 2016



Source: EU Labor Force Survey, Eurostat (European Commission, 2018c)

A dual-system approach to VET is currently being piloted. In the first pilot year, ten schools are expected to be part of this experimental phase and twenty in the second year.[53] As the pilot progresses, its expected impact on students, employers and the system should be assessed. In Croatia there is already ample experience with a *de facto* dual system, as in the 2003-2012 period all students in "JMO" 3-year programs (about 9 thousand per generation) had apprentice contracts and spent almost half of their education with employers, which were obliged to provide students with some remuneration. The new dual system proposes a fixed-term employee status for students starting in their second year of education. It will be important to evaluate employers' feedback on this arrangement, as one of the biggest challenges in WBL has been to attract enough employers to join the program in a sustainable manner. Businesses in the crafts and industry sectors, for example, in large part have been unable to or uninterested in hosting students, leading schools to switch to holding practical classes mostly in schools, instead of in the workplace. Interest from students in the four courses participating in the dual-system pilot, which were selected based on interest expressed by employers, has been modest and varied significantly from course to course.[54] The evidence on dual-learning programs is mixed. While a few European countries are well known for their successful experience with this model of VET (e.g., Germany, Austria and Switzerland), experience in other countries that attempted to implement a similar format of training has varied. In Bulgaria, for example, the approach only worked in a limited number of sectors, usually those most progressive and undergoing growth. In Latvia, even after important improvements were made to VET infrastructure and to boost VET networks, the close connection of VET institutions to the labor market

[52] Data from the most recent (2015) EU harmonized Continuing Vocational Training Survey (CVTS), Eurostat tables **trng_cvt_12s** (participation) and **trng_cvt_02n2** (reasons for not providing training)
[53] Out of a total of 258 technical and related schools, and 194 industrial and crafts schools - https://www.dualnoobrazovanje.hr/strukovno-obrazovanje-u-rh
[54] Školski e-rudnik; National Curriculum for VET; Decision in Placement, SER

and their dual-learning programs remained artificial. To date, the most discussed change in pilot programs in Croatia is the reduction in the share of general subjects, in particular in humanities. However, this change is not endemic to dual courses, but rather implemented in line with the new National Curriculum for Vocational Education" (NN 62/2018) adopted in July 2018 for all vocational programs. The new curriculum stipulates a reduction of the share of general subjects within 3-year (CQF 4.1) courses from the current 30-35 percent level to up to 20-25 percent. While a reduction in the share of general subjects is forthcoming in 4-year courses (CQF 4.2) as well, it is less pronounced for those programs (up to 45 percent of general subjects; now standing at about 50%). This policy might make the 3-year track even less attractive to prospective students, while depriving participants of general competencies that are highly important for lifelong learning, future employment prospects, and societal participation.

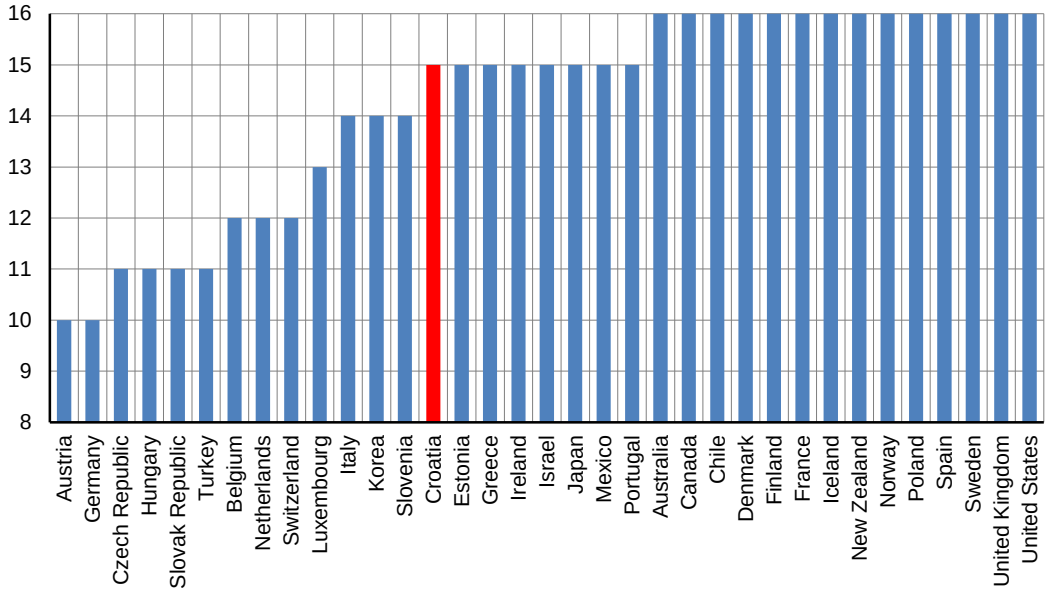
VET and adult education teachers have outdated technical and pedagogical competencies and are disconnected from current labor market requirements and practices. Given the centrality of teachers to all education systems, sustainable quality improvements in VET necessarily involve high quality training and support to teachers. Participation in vocational teacher in-service training is low in Croatia, as is the quality and relevance of the available in-service training. Other concerns in this area include deficiencies in the mechanism to measure and strengthen teacher competencies and motivation, in the system for professional advancement of teachers, and in the support provided to workplace mentors engaging in WBL.[55] With regards to the latter, a 25-hour training program for mentors in apprenticeships has been launched,[56] which could better prepare mentors and companies for apprenticeship arrangements for education in crafts and with the dual system model.

Three-year VET programs face some of the most serious challenges in the system, including the decreasing interest from students. Despite a shortage of labor in certain occupations requiring a 3-year degree, the sustainability of programs in the trades and crafts is threatened by a sharper decline in the number of students than other VET programs, which is overall associated with downward demographic trends, but is also due to the low attractiveness of the 3-year VET track. According to the Croatian Chamber of Trades and Crafts, there is a deficit of nearly 20,000 workers in crafts: around 3,200 carpenters, 2,200 bricklayers, 400 heating and ventilation workers, 200 natural gas fitters, 250 plumbers, 100 metal workers, 100 automotive mechanics, 80 welders, among others.[57] At the same time, in the educational structure of unemployed people in Croatia, VET programs lasting up to 3 years and programs in schools for skilled and highly skilled workers often represent the biggest share of profiles, although some of this can be attributed to the composition of the stock of unemployed people (3-year programs were among the most prominent until the mid-1990s; older unemployed people were more likely to have participated in one of these programs).[58] The limited opportunities for students to continue into higher education (e.g., lack of *de facto* vertical integration of 3-year courses) and to obtain more general and transferable competencies that would be valuable throughout their professional lives contribute to lowering the prestige of this VET track. In general, 3-year VET programs are the least popular in upper secondary education and often attract students with the lowest academic performance in lower secondary school. PISA performance of 3-year VET students confirms this. A lack of investment to train teachers and update and maintain equipment in 3-year courses, which often have a higher percentage of practical training, also affects these programs in a more unfavorable way.

[55] Government of Croatia, n.d.
[56] University of Zadar, 2017 (Cap4App)
[57] Croatia Media Monitoring (Media Scan), Sept. 6, 2018
[58] In 2018, out of the total registered unemployed population, 30 percent had a 3-year VET qualification and 26.3 percent had no upper secondary. In age group 25-30, 22.8 percent had a 3-year VET certificate and only 8.8 percent had less than upper secondary education - HZZ StatistiKa On-line.

In Croatia, students are tracked into vocational programs at 14 or 15 years of age, younger than in many EU and developed countries. Delaying tracking often involves greater opportunities for learning basic skills in math, reading and science, which are increasingly sought after by the labor market. Given the lower performance of students in the VET system in Croatia, extending the use of a general curriculum could bring positive results. Delaying the vocationalization of education, including through the inclusion of a higher number of hours of math instruction, has shown to be an important factor in the improvement of PISA scores in Poland and other countries (see Box 1).

Figure 13: Countries by age students first enter vocational tracks



Source: OECD 2010; Ministry of Science and Education, https://mzo.hr/en/rubrike/secondary-education

Box 1: Delayed Vocationalization Associated with Improved Test Scores

In 1999, Poland reformed its basic education system in order to raise the level of education in society, increase educational opportunities, and improve the quality of education. The new government at that time restructured basic education by converting the old 8-year primary school that was followed by early vocational tracking, into a 6-year primary education followed by three years of lower general secondary education (gimnazjum). A decision about what type of upper secondary education – academic or vocational – to undertake would then be made after 9 years of schooling. In other words, the new system postponed the choice of the type of curriculum to take at the secondary level (general or vocational) by one year. This structural change was accompanied by curricular reform. A concept of core curricula was developed which aimed to provide schools with extensive scope of autonomy and responsibility. A system of examination and tests at the end of primary and lower secondary was introduced.

On average, the reform was associated with significant improvements in international achievement tests. A study compared the change in test scores of the likely vocational school students that were able to study in the general, academic track because of the change in school policy. Using propensity score matching and differences-in-differences estimates, the study showed that delayed vocationalization had a positive and significant impact on student performance on the order of one standard deviation.

Clearly, given the importance of the reform program, other factors played a role in the increase in Poland's scores in PISA (students from poor and well-off socioeconomic backgrounds alike saw performance improvements in PISA scores between 2000 and 2012, placing above the OECD average and at the same levels as in countries such as Finland and Germany). Nevertheless, the introduction of the gimnazjum and delayed voca-

tionalization played a major role in these positive results. The pathway, the authors of the rigorous study mentioned above argue, was through increased hours of math instruction, possibly more exposure to testing, and increased motivation on the part of students and teachers. The study also suggested caution to policymakers about the effectiveness of vocational schooling when that schooling is not designed to improve math and reading skills The study showed such students can become more adept in math and reading skills if they are given the opportunity to, and these are important skills in the world of work today. In order to increase the overall test scores of these students, it is important to have them study these subjects. The study concluded that much of the test score increase in Poland in those years had to do with the delayed vocationalization of the secondary school curriculum.

Despite the progress achieved by Poland since the 1999 reform, some challenges remained, including the persistence of performance gaps previously found between vocational and general schools for 15-year-olds in upper secondary education, where the performance of students in vocational upper-secondary schools trailed that of their peers in general education. A lesson learned is that vocational training should not come at the expense of reading and mathematics: students can only be successful in learning vocational skills if they have strong foundational skills in those areas.

More recently, despite the evidence discussed, some of the reforms that led to Poland's improved learning outcomes have been reversed, including the phase out of the gimnazjum and the return to tracking after 8 years of general education, instead of 9 years. The positive lessons from the Polish experience, however, are still relevant to countries considering expanding general education and placing a greater focus on reading, math, science, creative/critical thinking and other fundamental skills needed for 21st century jobs.

Source: Jakubowski, M. et al, 2010; Wes and Bodewig, 2016.

Limited national oversight over the implementation of policy priorities has led to poor coordination and misalignments at the local level, aggravating the mismatch of skills in VET and adult education. The absence of enforcing mechanisms to align policy decisions at all levels of government have given room for important processes, such as decisions about course provision, to be handled in a haphazard, uncoordinated way or to be captured by local interests, resulting in overlaps and shortages of courses and skills in certain disciplines. Weak quality assurance mechanisms and lax certification procedures have contributed to an excessive number of VET and adult education providers and courses. According to the Croatian Agency for VET and Adult Education, in 2012/2013 there were 299 VET providers in the country (currently, this number is likely to be higher), which makes supporting and monitoring the quality of their offerings highly costly and inefficient.[55] The number of adult education providers is even larger, the proliferation of courses is significant and the distribution of providers is uneven across regions. According to the European Commission, participation in adult education and educational programs offered as part of active labor market policy measures are critically low.[59] While Croatia's VET System Development Programme (2016-2020) advocates for a unified VET quality assurance system, it has only been implemented in part.

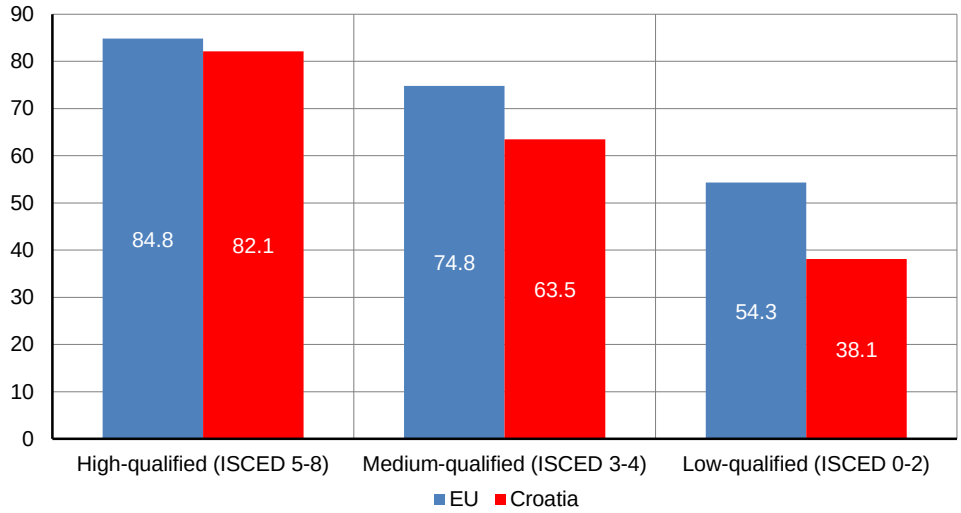
Croatia has one of the lowest rates of participation in adult learning in the EU, particularly among the low-skilled, older, rural, and long-term unemployed populations. Less than 2.5 percent of Croatia's adult population participated in formal and non-formal learning in 2017 compared to the EU average of 11 percent.[60] While Denmark, Sweden and Finland train close to a third of

[59] European Commission, 2018a

[60] Eurostats, updated 2018. Multiple studies, such as the Adult Education Survey (AES) and Continuing Vocational Training Survey (CVTS) confirm the low participation levels of Croatians in adult education, despite some methodological issues or inconsistencies in the surveys.

their population on a regular basis, Romania, Bulgaria, Slovakia, Poland and Croatia train less than 4 percent of their workforce.[61] One of the main reasons for these large regional variations is the low availability of employer-provided workplace training. In Sweden, for example, more than 70 percent of firms report offering formal worker training, whereas rates in Bulgaria, Slovenia, Romania, Poland, and Hungary are about half this number.[62] Scant training participation in the workplace and underutilization of firm expertise in delivering training that meets labor demand is a missed opportunity, which could, if seized, help both workers and firms grow. In addition to learning opportunities not being accessible at work or in local communities, other reasons cited for low participation in adult learning in Croatia include lack of knowledge of what is being offered, the poor quality of existing offers, costs, or simply a lack of interest.[63] While unemployed people in Croatia, as in other EU countries, can access training funded by active labor programs, employed Croatians who do not receive training from their employers may find it more difficult to access training and/or higher levels of education outside their work which would allow them to advance in their workplace or change careers. Croatians who have better (managerial) positions and have successful careers participate the most in lifelong learning (62 percent in this group participated in some form of learning the previous year), versus a participation level of 20 percent for manual workers.[64] The low levels of participation by the unemployed and low-skilled is particularly concerning given the potential benefits of re-skilling and up-skilling for this group (e.g., employment rates are the lowest for low-qualified workers, significantly below the EU average) and the need for increased productivity at the national level due to demographic pressures. In 2016 an adult education law draft was prepared, which aimed to address these issues, but it has yet to be approved.

Figure 14: Employment rates by educational attainment level for 25-64 year-olds (2016)



Source: Eurostat (LFS 2016), as cited by EU Commission 2017

[61] Eurostat, 2016 as cited in World Bank 2018 (Europe Skills for Competitiveness)
[62] Enterprise Surveys, 2014 as cited in World Bank, 2018 (Europe Skills for Competitiveness)
[63] AES and CVTS as cited in Matkovic 2018; Letica, Buic, and Vakanjac, 2014
[64] AES, 2007 as cited in Agency for VET and Adult Education, n.d.(a)

2.4 Higher Education and Science: Croatia has some of the lowest HE attainment and graduate employability rates in the EU and its performance in science is modest

Higher Education

Private returns to HE in Croatia are higher than the European average. The average rate of private return to another year of schooling was 11.6 percent a year in 2012 (the last year for which data is available for Croatia), up from 9.4 percent a year in 2004. This compares to an overall average of 7.4 percent for Europe and Central Asia and of 10 percent for High Income Economies for 1970-2013.[65] While data on the returns to schooling for the primary and secondary levels is not available for Croatia, the private return to schooling for HE was 13.1 percent in 2012 (11.7 percent for males and 15.3 percent for females)[66], which is higher than the average return for Croatia.[67] Adults who have completed HE benefit from higher returns on investment because they are more likely to be employed and to earn more than adults without HE. The average private net financial returns in all OECD countries in 2015 were about USD 319,600 for a male with HE education and USD 234,000 for a female.[68] Private returns to schooling have implications for financing and equity policies in HE. Furthermore, public returns to HE also include additional economic benefits, such as increased productivity, which in turn boost economic growth.[69] Despite the lack of specific Croatian data for public returns to HE, it is well established that they are considerable and should inform Croatian policies for financing HE.

However, Croatia has the third lowest Higher Education attainment rate in the EU. The rate of the population aged 30-34 that has successfully completed HE (ISCED 5-8) was 29 percent in 2017, compared to the EU average of 40 percent. The EU target within the ET 2020 process is to reach 40 percent by 2020, while the Croatian national target is 35 percent by the same date. Only Romania and Italy have lower HE attainment. Croatia's growth in the number of HE graduates in the past decade has reverted into a downward trend since 2014, aggravated by high-skilled emigration, which will hamper achieving the 2020 targets.

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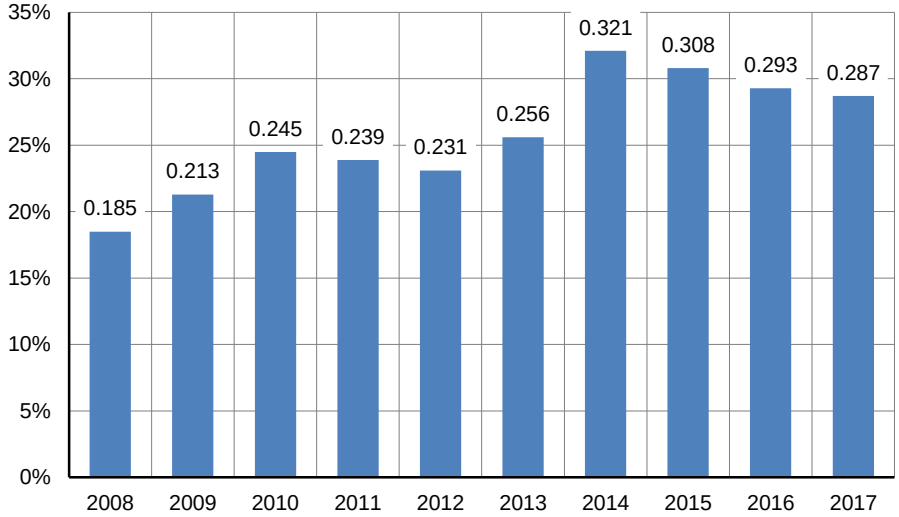
[65] Public and private returns at all levels generally decline by the level of a country's per capita income.

[66] Around the world, the returns to schooling are higher for women than for men. This does not imply that earnings are higher for women, but only that education is a good investment for women and girls, and a development priority (Psacharopoulos and Patrinos, 2018). While women often earn less than men, it is believed that private returns to investments in schooling are higher for women in part because a minor but important side-benefit of schooling for women is that it reduces the gap between men's and women's earning attributable to factors such as discrimination, tastes and circumstances (Dougherty, 2005).

[67] Montenegro and Patrinos, 2014

[68] OECD, 2018:105. "This means that, over a career of 40 years, a tertiary-educated man will get about USD 2 100 more per year in total benefits (compared to a man with only upper secondary education) than a woman with the same level of education. This is mainly due to gender gaps in earnings, but is also related to higher inactivity and unemployment rates for women" (OECD, 2018:105).

Figure 15: Higher education attainment in Croatia, 2008-2017



Source: Eurostat

High-skilled emigration represents a serious threat to the sustainability of the current HE policy setup. According to a survey by the Agency for Science and Higher Education (ASHE), 47.5 percent of all high school students see themselves 20 years from now outside of Croatia.[70] HE has become a nearly mandatory element of a normative career path for high school students, with 68 percent of the upper secondary cohort enrolling into HE.[71] Yet the HE attainment rate has been declining since 2014, with high-skilled emigration being a possible cause for this trend.[72] Thirty-five percent of the approximately 150,000 Croatian emigrants in 2013-2017 are in the age group 25-40 years.[73] This shows that mostly the young emigrate – a significant loss of human capital for the country. Despite the lack of data on the educational background of emigrants, it is probable that attaining a HE degree in Croatia provides an incentive for labor mobility, and therefore high-skilled citizens might account for a substantial share of emigration since Croatia joined the EU in 2013. Further research is required to understand the impact of high-skilled emigration and to adapt the setup of HE and other public policies in Croatia. Given current emigration trends, Croatia may in fact be producing a significant amount of high-skilled labor for Germany, Austria, and Ireland, the most popular destination countries for Croatian emigrants.

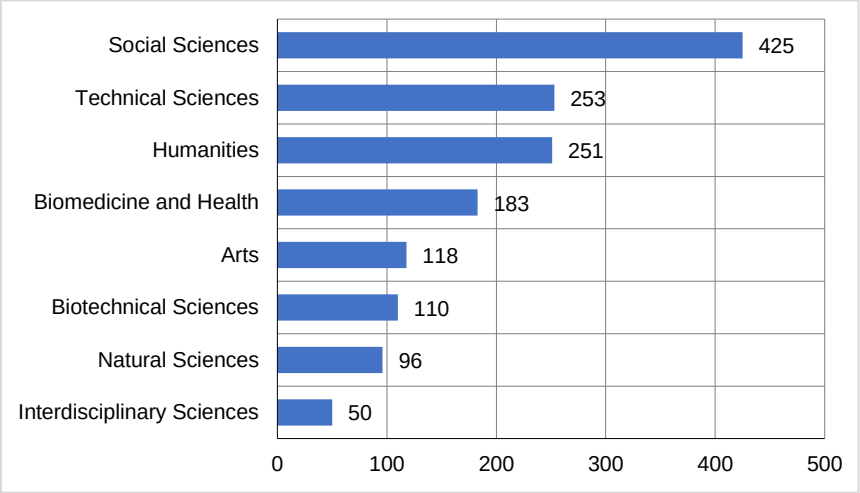
Low employability of recent HE graduates, compared to the EU, persists despite recent economic growth. Employability of graduates is an important dimension of the labor market relevance of HE. In 2008, 86 percent of Croatian graduates (ISCED 5-8) aged 20-34 who had graduated within the previous three years were employed.[74] By 2017, this rate had dropped to 72 percent, ranking among the lowest rates in the EU, which had an average of 85 percent.[75] Only Italy and Greece have lower employment rates of recent graduates. The ET 2020 benchmark of at least 82 percent of recent HE graduates to

[70] ASHE, 2018
[71] ASHE, 2014
[72] Emigration is currently not tracked according to education level and limited academic reference exists on this topic.
[73] CBS, 2018
[74] European Commission, 2017c (page 8 of Croatian edition)
[75] European Commission, 2017c (page 8 of Croatian edition)

be employed is out of reach for Croatia. The unemployment rate of HE graduates peaked in 2013 at 11 percent, but by 2017 had dropped to 7 percent. However, this unemployment rate was still the fourth highest in the EU (average of 4.5 percent). Almost 30 percent of employed graduates with a bachelor's degree work in jobs that require competencies below their qualifications.

The number of study programs has grown substantially in the last decade, but there are no effective instruments in place to secure their relevance. The number of study programs offered in Croatian HE has undergone a marked increase, reaching 1,486 study programs in 2018,[76] an increase of 81 percent from 2005.[77] Almost a third of all study programs (29 percent) are in social sciences, almost half of which are business programs. The first reaccreditation cycle of HE institutions in 2010-2015 strengthened their organizational capacity for quality assurance but did not focus on the relevance of these study programs. The reaccreditation analysis revealed serious deficiencies in the coherent implementation of learning outcomes approaches and related European Credit Transfer and Accumulation System (ECTS) credits allocation in curricula design and curricula delivery.[78] The analysis revealed that there is no systemic mechanism to match HE admissions quota with labor market and societal needs, this is exacerbated by the fact that universities are allowed by law to act autonomously when defining entrance quotas.

Figure 16: Number of HE study programs in Croatia per field of study



Source: MOZVAG, 2018

Croatia has successfully set up a national qualifications framework, but the system is not yet fully functional and more work remains to be done in order to make study programs more rele-

[76] MOZVAG, 2018

[77] Before 2005, Croatia had just over 400 study programs (NCHE, 2011). By 2005, HE institutions offered 819 programs and had enrolled 132,952 students. By 2013, HE institutions already offered 1,334 study programs, an increase of 63 percent and had enrolled 161,911 students, an increase of 22 percent (Šćukanec (2013:5). Since 2013, HE enrollment remained at ca. 160,000 students. Nevertheless the number of study programs kept increasing, and in October 2018 has reached 1,486, an increase of 81 percent in relation to 2005. HE institutions enrolled 159,430 students in 2013, an increase of 20 percent in relation to 2005.

[78] ASHE, 2017

vant to the labor market. The CROQF is intended as a key structural reform instrument that the Ministry of Science and Education (MSE) plans to use for improving the quality and relevance of qualifications and study programs, as well as for establishing systemic links between the educational offerings and labor market and societal needs. In 2013, Croatia adopted the comprehensive CROQF Act for lifelong learning that covers all levels and sectors of education. In 2014, the CROQF Register was designed as a publicly accessible online repository of occupation and qualification standards, defined in terms of learning outcomes, student workload, educational level, and indication of possible progression routes. As of October 2018, this register does not yet contain HE qualification standards. According to MSE, HE institutions have developed 173 qualification standards,[79] but they have not yet been entered into the register. In 2018, MSE finished creating a cross-sectoral organizational structure for the development of the CROQF. It consists of 25 sectoral councils charged with validating occupation and qualification standards.

MSE has introduced numerous policy levers to enhance equity in higher education, which are starting to have a positive impact. The policy mix for improving equity includes an improved funding policy, which has incorporated equity indicators in the funding agreements between MSE and HE institutions. To widen HE participation, MSE has covered tuition fee subsidies to public HE institutions since 2012, thus allowing all full-time undergraduate and graduate students that enroll for the first time to study free of charge in their first year. To stimulate completion, MSE has introduced a linear tuition fee system, which means that the state will continue to cover tuition costs in following years of study only for students earning a required minimum of ECTS credits. In 2013, the state student support system was revised to become need-based, focused on direct support in the form of scholarships, and directed primarily towards students of lower socio-economic status. Recent *Eurostudent* data showed an increase in the share of students whose parents did not complete HE, a proxy for lower socio-economic status, from 50 percent in 2010 to 58 percent in 2016, which suggests that the policy mix had a positive impact. To secure policy coherence for further enhancement of equity, MSE established an expert body, the National Group for Enhancement of Social Dimension in HE. This Group produced the *National Plan for the Enhancement of Equity in HE 2018-2021*, which the Croatian Government adopted in early 2019.

The Croatian state system for financing public HE still lacks coherence and transparency, despite continuous reforms since 2012. Croatian public expenditure on HE was 1 percent of GDP in 2013, while the EU average was 1.3 percent of GDP. The financing system of HE institutions is a combination of a) historic allocation (the biggest portion, mainly salaries), b) a supplement paid based on the new linear tuition fee system, and c) a performance-based funding component for achieving targets related to national strategic goals. Since 2012, these three components were included in funding agreements that had been negotiated between the state and HE institutions for three-year cycles (2012-2015 and 2015-2018). However, no evaluation has been done on whether HE institutions have achieved agreed institutional goals at the end of the funding cycles. The new funding agreements for 2019-2021 should be signed in the last quarter of 2018, but there is currently no public information available on their content.

Scholarships are awarded to 23 percent of students, with part-time students excluded from any state support. The 2014 *Eurostudent* survey points to three main sources of income Croatian students must combine to cover their total study costs: 88 percent of students rely on family support, 38 percent have a job, and only 23 percent benefit from scholarships.[80] The share of scholarships in the average total student income is low, at 10 percent, so that students finance their study costs primarily

[79] Government, 2018b:18
[80] Šćukanec et al., 2016

from private sources, which is concerning with regard to equity for disadvantaged learners. The state provides the largest share of student support, around 70 percent of total funds, indirectly in the form of subsidized meals. The status of part-time students, which represented 28 percent of the student population in 2016, raises concerns related to equity, because they are currently not eligible for any state student support. They are excluded from the linear tuition fee system and must always pay full tuition. Part-time students have the highest share (in the total student population) of older students and the highest share of students with lower socio-economic status.[81]

The Croatian HE system's legal framework is outdated and incoherent. Aggravated by the poorly integrated university structure[82], this framework represents an obstacle to HE reform. The key legislation of Croatian HE is the 2003 Act on Scientific Activity and Higher Education, which has been amended and supplemented 12 times. Representatives of the academic community tend to resolve disagreements over legislative ambiguities by appealing to the Constitutional Court instead of seeking dialogue and consensus. Between 2014 and 2018, the Constitutional Court had to consider five such requests to assess the constitutionality and legality of contentious issues. The four biggest universities, in which 72 percent of students were enrolled in 2016, have an un-integrated structure, where each faculty has legal autonomy. This creates a multitude of legal entities, which hinders efficient strategic and financial management and governance. The current legal framework does not provide a functional basis for solving these problems.

The framework for the internationalization of Croatian tertiary education is in the early stages of development. Study programs offered in foreign languages, as well as joint study programs, are limited. In 2015, Croatia was, along with Albania and Moldova, one of the top net exporting countries of students in the European Higher Education Area.[83] Outbound student mobility (approximately 5 percent of the total student population; the national target until 2025 is 10 percent) far exceeded inbound student mobility (approximately 0.6 percent, the national target for 2025 is 5 percent).[84]

Science

The Croatian research system has recently undergone several important changes regarding the government bodies and institutions responsible for the entire science sector. Governance of the system is still primarily centralized, and the main responsibilities and key decision-making capacity lie with Parliament and the Croatian Government, especially MSE. The areas of innovation policy and entrepreneurship are the responsibility of the Ministry of Economy, Entrepreneurship and Crafts (MEEC). These two ministries have a major role in governance and funding of research and innovation activities in Croatia, especially when taking into consideration the increasing role of the ESIF in financing R&I activities.

Public research institutes and HE institutions are a key part of the Croatian research system. The system has 184 scientific organizations registered at the Register of Scientific Organizations,[85] managed by MSE. These include 25 public research institutes and 87 HE institutions. There are also 2 private

[81] Šćukanec et al., 2016
[82] Big public universities consist from faculties that retain a separate and independent legal status.
[83] ECEE, 2018
[84] These shares refer to both credit and degree mobility.
[85] http://pregledi.mzos.hr/Ustanove_Z.aspx

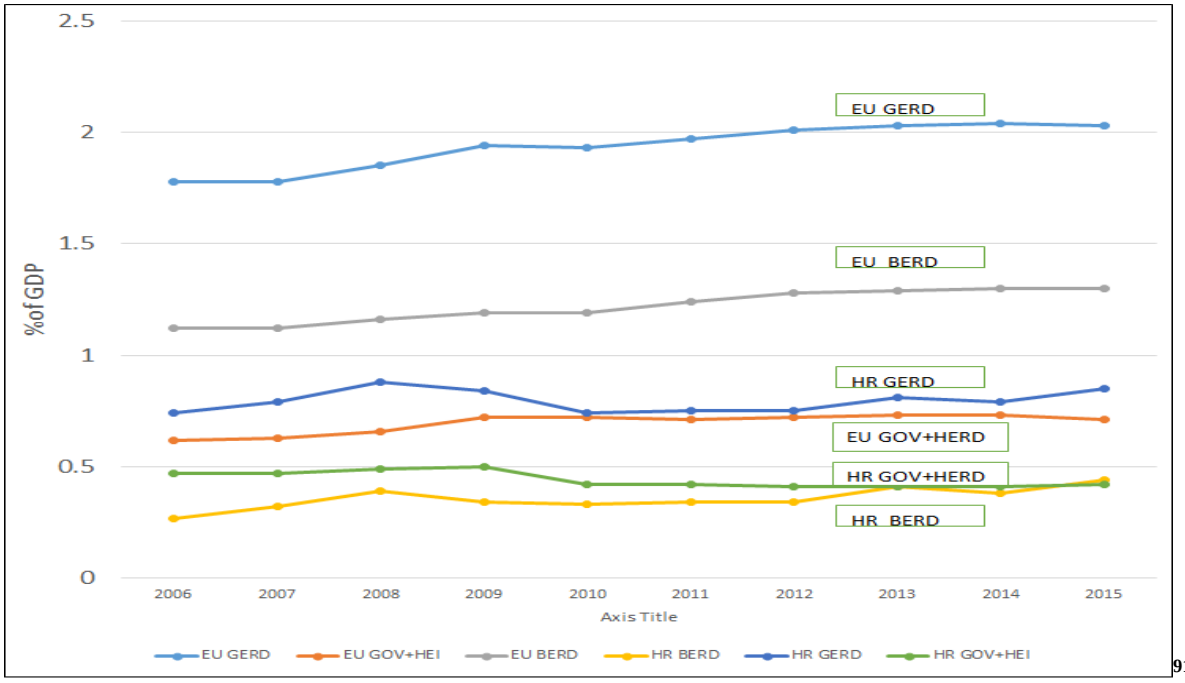
research institutes, and 51 institutions listed as "other scientific and research organizations," which include companies engaged in scientific research, hospitals, institutes, and museums, among others. As reported in the RIO Country Report for 2017,[86] Croatia has several public research institutes focused on applied research and services offered on the market (e.g., Energy Institute Hrvoje Požar), as well as 25 private research organizations, which are either independent institutes (e.g., the Mediterranean Institute for Life Sciences) or are associated with corporations, for example Ericsson Nikola Tesla (ICT), PLIVA (pharmaceuticals), Podravka (food industry) and Končar Electrical Engineering Institute (electrical engineering).

Despite recent increases, the share of researchers in the active population in Croatia remains below the EU average. The Croatian scientific community is relatively small, with a headcount of 12,618 researchers, or 7,555 researchers expressed in full time equivalent.[87] The number of researchers increased in 2016, for the first time since 2010. The share of researchers employed in the business sector also increased to 21 percent of total researchers, compared to 15-17 percent in previous years. However, the public sector continued to employ 83 percent of all Croatian researchers in 2015,[88] which is due to the Croatian economy's structure and its low levels of technological intensity, a HE and science system that does not sufficiently focus on the international relevance or international project success of research, as well as due to the hiring and advancement system of researchers that are not flexible and do not foster interaction with the industry, leading to a low degree of mobility of researchers between the public and private sectors.

Implementation of policy objectives in science and innovation is deficient, which is reflected by lackluster performance indicators. Croatia recognized the role of science and innovation as main economic drivers more than a decade ago and stated the development of a coherent national research and innovation system was a priority in its main strategies. However, the main research, development and innovation (RDI) performance indicators do not reflect the envisaged growth. Croatia is among the lowest ranked EU member states in many indicators of research excellence (e.g., top 10 percent highly cited publications and Horizon 2020 funding received per capita) as well as in the international mobility of researchers. The European Innovation Scoreboard (EIS)[89] for 2018 describes Croatia as a moderate innovator, ranking it 32nd out of 36 countries included in the survey. Only Bulgaria, Macedonia, Romania, and Ukraine, also considered moderate innovators, have lower scores than Croatia. EIS evaluated firm investments and innovators as the strongest innovation dimensions in Croatia and intellectual assets as the weakest. The Croatian innovation system is often perceived as inefficient and characterized by fragmentation, subscale investments and poorly designed policies.[90]

[86] Račić, Švarc, and Testa, 2018
[87] Eurostat
[88] Croatian Bureau of Statistics
[89] European Commission, n.d.
[90] European Commission, Country Report Croatia 2015: Including an In-depth Review on the Prevention and Correction of Macroeconomic Imbalances (European Semester). Available at: http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_croatia_en.pdf

Figure 17: Comparison of investments in R&I, EU-28 and Croatia (2006-2015)



[91]

Source: Eurostat

Expenditures on R&D have been stagnant, and their composition is suboptimal, as the share of the private sector is low. Total gross domestic expenditure on R&D (GERD) has been mostly stagnant over the last several years and reached 0.84 percent of GDP (EUR 388 million)[92] in 2016, a significant decline from the 2004 level of 1.3 percent of GDP. This is also below the national target of 1.4 percent of GDP[93] from ET 2020, as well as significantly below the EU-28 average of 2.03 percent in 2016. When sectors of performance are observed, public expenditure on R&I amounted to 55.2 percent of GERD in 2016, while business expenditure on R&D reached the level of 44.8 percent of GERD.[94] Compared to other EU member countries, Croatia has the eighth lowest investments in R&I in absolute numbers and fourth lowest investment in R&D in euros per inhabitant (EUR 93.6 per inhabitant, which is about 16 percent of the EU-28 average of EUR 593.7).

Multiple factors contribute to Croatia's low performance in science and innovation. Low levels of investments in R&I can be partially attributed to the general deceleration of the Croatian economy, initiated by the global financial crisis in 2008. However, as reported in the RIO Report for 2017,[95] long-term structural gaps of the national economy, including strong reliance on the service sector (e.g., tourism), budget restrictions, low entrepreneurship and innovation capital, also contribute to the low interest in R&I by public and private entities. While access to finance can be considered as a key obstacle to improved research and innovation performance, there are other factors as well, such as, among others, the insufficient integration of research performers in the European Research Area (ERA), low capacities of entrepreneurs for absorption of innovation and new technologies, lack of cooperation between science and industry, unclear regulation of intellectual property at public research organizations (PROs) and HE

[91] BERD stands for business enterprise expenditure on R&D; GERD stands for gross domestic expenditure on R&D
[92] Eurostat, 2018c
[93] Eurostat, 2018d
[94] Eurostat, 2018
[95] Račić, Švarc, and Testa, 2018

institutions, a system of HE institutional governance that does not foster excellence and international experience, and a rigid hiring and advancement system that hinders mobility and does not motivate the best researchers.

The government attempted a research funding reform, with limited success. A research funding reform was initiated in 2013, aimed at improving research excellence, competitiveness and performance-based institutional funding. A new model of R&D funding that awards multi-annual block grants to research organizations has been introduced by MSE and is financed by the State Budget. On the other hand, responsibility for awarding project-based R&D grants has been transferred from MSE to the Croatian Science Foundation (CSF), and was accompanied by the introduction of a more rigorous project evaluation, resulting in a decrease of about 20 percent in the number of funded projects. Projects supported are expected to be of greater quality. At the same time, new modes of institutional funding have been introduced, such as Centers of Research Excellence, initially funded by the MSE from the State Budget, with additional funding ensured through ESIF. Restructuring of the public research institutes was to accompany this process and was initiated in 2014 but is yet to be completed. Despite the promising beginning of the reform, major structural changes were not followed by the necessary capacity building and reforming of HE institutions and PROs, which would have enabled them to compete for research grants at the EU level more successfully. Consequently, this failure led to a significant decrease of public funding of R&D activities, while other expected impacts of the reform have remained limited. Public spending on R&I as a proportion of GDP decreased from 74 percent of the EU-28 average in 2008 to only 58 percent in 2015. Budget restrictions resulted in a decline in public sector R&D intensity, from 0.5 percent in 2009 to 0.42 percent in 2015. Government budget appropriations or outlays on R&D (GBAORD) has been relatively constant, around 1.5 percent of total government expenditures, which is slightly above the EU-28 average of about 1.4 percent.

There is increasing reliance on the European Structural and Investment Funds (ESIF), but complicated, rigid and sometimes hard to interpret rules coupled with inefficient administration hinders their absorption and effective implementation. Due to the decrease of available public funds for research activities and generally low availability of other modes of funding, ESIF are becoming increasingly important in funding competitive RDI activities in Croatia. However, public calls for projects involve complex administrative procedures (i.e., more demanding than in the case of programs centrally managed at the EU level), which contributed to significant delays in the implementation of calls for proposals. Evaluation of project proposals is often delayed and does not meet the deadlines indicated in documentation of the public calls (usually 120 days), which disrupts efficient planning of R&D activities on an institutional level and reduces the impact of funding when eventually contracted[96]. One of the main reasons behind the issues with the evaluation of project proposals is the limited availability of external evaluators. A possible solution, used successfully by many EU member states, could be to allow project proposals to be submitted in English so that they can be evaluated by foreign evaluators.[97] MSE

[96] As an example, the call "Investing in Science and Innovation – First Call" was published in 2017, with the deadline for application on 2nd October 2017. As on November 2018, the evaluation of the received project proposal is still ongoing, regardless of the indicative duration of evaluation of 120 days, as indicated in the documentation of the call.

[97] As a reference, in certain cases (e.g., calls Support for Development of the Centers of Competence and Increasing the Development of New Products and Services that Result from Research and Development Activities, both, under MEEC), implementing authorities evaluate project proposals in order of their receipt, based on the principle of "first come – first served." While this apparently does not shorten the evaluation procedure, this type of evaluation does provide advantages to less complex project proposals, which can be prepared faster and achieve the minimum criteria needed for awarding of funds.

has been investing efforts to enhance its administrative capacity through education, training and hiring new staff. However, due to complex administrative procedures, the assigned deadline of 120 days is likely to remain a challenge. MRDEUF should thus consider some administrative simplifications, in order to speed up the project evaluation process. There has also been a significant lack of modes of funding other than grants, such as tax reliefs,[98] public procurement for innovation or venture capital, which would increase RDI in the private sector. These issues are elaborated in more detail in the following sections.

High fragmentation and a lack of coordination in the research sector hinder the achievement of excellence and make creating linkages with the business sector more difficult. The average number of researchers in the public sector is fewer than 100 per institution. Generally, the relatively small research community, coupled with an increasing "brain drain" trend, hinders improvement efforts that do not include structural reforms of the organization and governance of PROs in Croatia. The need for structural reforms in the public research sector has been emphasized in all relevant national strategic documents, as well as in international analyses. The fragmentation of PROs negatively affects their efficient coordination and allocation of resource. At the same time, it impacts long-term planning at PROs, as well as their efficient response to changes in the environment and the needs of the industry, which further limits their international visibility and competitiveness. The lack of public-private cooperation is a core weakness of the Croatian innovation system, as highlighted by the RIO Country Report. Unsurprisingly, Croatia performs poorly in the number of public-private co-publications (per million population) with an average of 5.7 versus the EU average of 28.7. The country ranks significantly behind countries with similar academic traditions such as Austria, Slovenia, and Hungary. Moreover, in the ranking of the Global Competitiveness Index for university-industry collaboration in R&D, Croatia places 118th out of 137 countries, below all of its peers.

Policies to improve governance, funding, networking and internationalization of HE institutions and PROs are required to increase their effectiveness. Governance reforms should lead to a more proactive development of HE institutions and PROs based on strategic choices and resource allocations. In order to harness the full potential of the RDI sector, policies should take into account the entire research and innovation value chain, from fundamental research to applied research and innovation; that also requires the effective coordination of the relevant stakeholders from public, academic and private sectors. The government can foster a policy dialogue on governance reforms and provide regulations and incentives. New or redesigned funding mechanisms need to follow governance reforms. Increased responsibilities of HE institutions and PROs should be matched by corresponding incentives and funding mechanisms, including performance agreements, competitive research grants, innovation finance (e.g., seed and venture capital) and additional funding for governance reforms, networking and internationalization, where appropriate. Networking (relationship management) requires an active relationship with one's stakeholders, in which one-off collaborations (e.g., due to availability of ESI funding) will be complemented and/or replaced by strategic relationships with partners from academia, business and civil society. The government can provide supportive regulation and incentives, especially when it comes to joint projects, knowledge transfer and the mobility of staff between organizations and sectors. Internationalization entails broadening the geographical perspectives when it comes to accessing key resources, competencies and opportunities. In this regard government can provide support not only to specific projects, but also to the activities through which projects and collaborations are developed, especially at the EU level.

[98] Tax relief for R&D existed until the end of 2014. In July 2018 the new Act on State Aid for Research and Development Projects was adopted.

The changes of different elements in the HE and science system should be observed over time. Longitudinal observations are needed due to the complexity of the transformation of the system, which combines a bottom-up approach with a top-down support. In the short term, incentives and regulations can be (re)defined, which will primarily affect activities and projects. These should be observable at the levels of inputs into RDI activities. In the medium term, as new activities and projects lead to results (outputs) and become ingrained in HE institutions' and PRO's strategies and organizational cultures, these organizations are likely to change. Finally, in the long term the systems of HE and science should also change, which should be discernible at the level of outcomes. The gradual nature of this transformation should be acknowledged in the monitoring and evaluation of the relevant policy measures which are to be designed and implemented.

3 Assessment of the Main Developmental Challenges and Opportunities for Croatia

3.1 Main challenges:

3.1.1 Early Childhood Education and Care: Inadequate physical, human and financial resources hinder expansion of pre-primary education

Challenge 1: Suboptimal number and spots in ECEC institutions results in low access to ECEC – Unlike most EU countries, Croatia does not offer guaranteed placement for children in ECEC (legal right to ECEC). Not enough ECEC institutions and spots within the existing kindergartens are available to ensure adequate coverage in pre-primary programs. The situation is worse for children up to 3 years of age, in rural, less developed areas and among the Roma national minority. Despite an increase in the number of kindergartens and placements in recent years, according to the current rate of expansion, Croatia is unlikely to meet its national and EU2020 95 percent enrollment goal for 4-6-year-old. Current EU funds for expansion of access are often disbursed at the local level and are sub-optimized due to lack of coordination and a clear expansion strategy at the national level that takes regional demographic changes, as well as the needs of the most disadvantaged areas, into consideration.

***Challenge 2: L*ack of teachers could represent a problem for the expansion of ECEC –** Not enough ECEC teachers and support professionals exist to expand the system towards universal coverage and to ensure the quality of the programs. Croatia's ability to train and hire an adequate number of pre-primary teachers is one of the main challenges to increasing ECEC access. Teachers and support professionals must be mobilized when and where they are most needed. New teachers are likely to face more challenging cohorts of learners, and will require stronger training and support in inclusiveness of diverse populations of children.

Challenge 3: **Funding model hinders wider participation in pre-primary education –** The near total decentralization of ECEC costs to municipalities has exacerbated regional differences in ECEC coverage and is considered one of the main impediments to wider participation in pre-primary education, especially in poorer municipalities.[99] At the family level, ECEC is unaffordable to many families. There is also a lack of standardization in fees charged to families. Cost has been cited as one of the biggest challenges for enrollment in ECEC by families,[100] and issues of affordability disproportionately affect the most disadvantaged children, who would likely benefit from high quality early learning the most. While Croatia recently earmarked nearly EUR120 million in investments to ECEC (EUR 40 million from the ESF, EUR 70 million from the European Agricultural Fund for Rural Development and EUR 9 million from the national funds) to improve the quality, access and infrastructure of pre-primary education and care in the country,[101] progress is yet to be made in regards to changing the funding model to allow for a more sustainable expansion of ECEC.

Challenge 4: **Disadvantaged families face greater challenges in accessing ECEC –** Systemic obstacles for children from vulnerable groups to enroll in ECEC exist; there is a lack of awareness about the benefits of ECEC along socio-economic status, geographical and minority lines. While the limited

[99] European Commission, 2018c
[100] Eurofound 2012 as cited in Peeters, 2018
[101] European Commission, 2018c

number of ECEC spaces affects children and families across regions and socio-economic groups, challenges are greater for disadvantaged families who live in areas with fewer placements, where kindergartens are located farther apart, as they are often unable to afford to enroll all their children even if spaces are available and might underrate the benefits of ECEC. Everywhere, public spending on ECEC is an important guarantee for equity. Without sufficient public spending, there is an increased risk that access to ECEC will be restricted to more affluent families and regions and that the quality of programs will vary significantly.[102]

Challenge 5: **Suboptimal division of responsibilities for ECEC among the central and local government affects system efficiency –** There is a suboptimal division of responsibilities for ECEC among the central and local governments. Economies of scale are not utilized and resources and support are often not directed to the most important issues and in the areas with greatest needs. Small and poor local government units often lack the capacity and financial resources to design and implement ECEC policies in an efficient and effective way. Analogously, in its 2018 European Semester recommendations for Croatia, the EU Commission encouraged the country to "reduce the territorial fragmentation of the public administration, streamline the functional distribution of competencies and enhance the capacity to design and implement public policies."

Challenge 6: Lack of an ECEC quality assurance system contribute to suboptimal system **performance –** Typically, within a framework of quality assurance, systematic analyses are conducted to inform decision-making and adjustments to the system aiming to enhance educational practice and support education goals. This reflects an evidence-based approach to education. In Croatia, however, no clearly structured and coherent education quality assurance system exists. Neither the evaluation of the quality of the management system nor the monitoring of the efficiency of ECEC agencies operating within the system has been established. There is also no systematic external evaluation of education institutions, nor has any systematic monitoring of the quality of work of key stakeholders in the system (principals, professionals in ECEC, teachers and other educational staff) been established.

3.1.2 Primary and Secondary Education: Low instruction time, outdated curricula, inefficient spending and limited use of public sector management approaches contribute to poor learning outcomes

Challenge 1: **Low annual instruction time in key subjects contribute to subpar learning outcomes –**

Compulsory education in Croatia is one of the shortest, in terms of duration, in Europe, which is likely associated with below-average learning outcomes in PISA. In most European education systems, full-time compulsory education lasts 9-10 years, ending at the age of 15-16. In Croatia, children and youth spend 8 years in compulsory education, plus a minimum of 250 hours the year before they enter first grade in a mandatory pre-school program, graduating lower secondary school at the age of 14-15 In Europe, all other countries have longer recommended compulsory education, except for Serbia, which also has an 8-year system. In 23 EU countries, including Croatia, compulsory education lasts less than 7,600 hours. In the 12+ countries that have compulsory education lasting 10-12 years, the recommended

[102] OECD, 2017

minimum number of hours varies from 7,616 to 11,240 hours. In primary education, the average minimum instruction time per notional year in Europe is 727 hours. The annual instruction time ranges from below 500 hours in Croatia and other countries such as Bulgaria and Romania, to more than 900 hours in Denmark, Ireland, Luxembourg and the Netherlands. In general, for lower secondary education the average minimum instruction time per notional year is 857, ranging from 637 hours in Croatia and 647 in Montenegro up to 1,000 hours or more in Denmark, Spain and the Netherlands.[103, 104] Short compulsory education can leave an inadequately short quantity of time for students to develop key competencies in critical subject matters and the skills necessary for lifelong learning.

Challenge 2: **The school network presents multiple challenges for expanding instructional hours in an efficient way –** The current network presents a dual challenge: on one hand, nearly half of all Croatian primary students are enrolled in schools that operate in two shifts, while on the other hand, the number of small schools is increasing, and these schools are becoming smaller and smaller. Schools that run in double shifts, and sometimes even in triple shifts, make increasing the number of instructional hours per day more difficult. Small schools are inefficient from both a cost and quality perspective: it is expensive to keep running half-empty buildings and classrooms with low student-teacher ratios, and attracting talented teachers and principals to very small schools is challenging.

Challenge 3: **Lack of access to ECEC, limited support to struggling students, lack of investments in VET teachers and infrastructure, among others, contribute to poor learning outcomes among students from low socio-economic backgrounds –** Students in the bottom of the wealth quintiles attend pre-primary education at lower rates than their wealthier counterparts, which leaves them less prepared for primary and secondary education and lifelong learning. The identification of students who need the most support is suboptimal as comparative data at a national level is not easily available (the Matura exam is the only national assessment and comes too late into students' academic career). Concerted support to students that are identified as struggling academically is also limited, leading to inadequate opportunities for poor students to catch up. Lower student-teacher ratios are one of the most common approaches used to counterbalance student's low SES, but limited effort is made to allocate the most experienced teachers to disadvantaged students. Allocating the most experienced teachers to disadvantaged students presents a good practice in these situations.[105] Students from the bottom SES quintiles disproportionally attend VET 3- and 4-year programs, which often rely on teachers with outdated knowledge and teaching skills.

Challenge 4: **Curricula and current teaching practices emphasis do not support students developing advanced problem-solving skills** – A tendency towards prioritizing the memorization of facts at the expense of devoting more time to the development of critical thinking skills, a curriculum that is outdated and lacks in relevance, use of non-student-centric teaching approaches and in some cases reliance on outdated textbooks are some of the weaknesses of the Croatian education system. While the ongoing curricula reform aims to correct these issues, its delayed and partial implementation inhibits much-needed improvements. An unstable institutional framework, as well as lack of transparency and commitment to implementation of strategic objectives, negatively impact students in the classroom who remain subject to an outdated curricula and inadequate teacher practices. Despite having started in 2015, the curricula reform still lacks an approved action plan for its implementation.

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[103] European Commission/EACEA/Eurydice, 2018b.
[104] The weight of mathematics in the curriculum of primary education is especially high in Germany, France, Croatia, Portugal and Serbia. Mathematics is particularly important in the instruction time for compulsory general secondary education in Croatia, Latvia and Montenegro
[105] Avvisati, 2018

Challenge 5: **A range of teacher-related challenges affects the quality of the Croatian education system –** Critical to the improvement of student learning in Math and Science is the availability of experienced, committed teachers. Croatia, however, has a shortage of teachers in STEM disciplines, especially Math and Science. While further analysis of the main factors contributing to Croatia's PISA performance in Math and Science is required, the inability to attract and retain high quality teachers in these disciplines is worrisome. These shortages in STEM and other disciplines, such as foreign languages, are well-documented and not new. The fourth goal of the pre-tertiary education section of the 2014 Education, Science and Technology Strategy (improving quality of work and social standing of teachers) raises the issues of inadequate qualifications of teachers in some less developed regions, as well as a deficit of qualified teachers in the subjects above-mentioned, associating these shortages with poor Croatia's PISA performance. The Croatian Employment Service's annual "Recommendations for education enrollment and student grant policy" regularly mentions the need for an increase in Math teachers in all or almost all regions (together with IT and Physics teachers, followed by - albeit in lower frequency - English/German and Science teachers, but infrequently by Croatian language/literacy teachers). It is well known that schools struggle to find staff in these areas and turnover is high. Although the problem of securing enough qualified STEM teachers when much better employment opportunities exist outside of the education sector is not unique to Croatia, the problem might have been compounding over time and is likely exacerbated by Croatia's high emigration rates. The relatively low attractiveness and status of the teaching profession is seen as an obstacle to improvements in this front. Croatia also lacks national qualification standards, despite it being a priority of the curricula reform. While a framework for the National Qualification Standards has been drafted in alignment with CROQF, no progress has been made regarding the actual standards. Student-teacher ratios have also declined significantly and faster than the average EU rate, without commensurate improvements in student outcomes. The student-teacher ratio in primary education in Croatia fell from 20 in 1996 to 13 in 2016, in part due to smaller schools that don't have enough students to fill regular-size classrooms. While a similar trend is seen across Europe, the decline is much more gradual than in Croatia (on average, from 16 in 1996 to 14 in 2016). The situation is similar at the secondary level. While the student-teacher ratio in Croatia in secondary education in 1996 was 14, it fell substantially, to 7 in 2016. In Europe that ratio remained stable, at around 11 in 1996 and 2016.[106] These sharp decreases in Croatia are likely accompanied by rising per-student costs, which raise concerns about the efficiency and sustainability of the current situation. While the number of teachers in primary and secondary education might be too high in Croatia, its ECEC subsector is characterized by a shortage of teachers, indicating another inefficiency in the system.

Challenge 6: **Limited use of data and modern policy instruments hinders Croatia's capacity to implement evidence-based change –** Currently, Croatia only conducts student standardized assessments at the end of upper secondary education (Matura exam). Without data about student and system performance in other points in time (e.g., 4th grade), policymakers and teachers miss the opportunity to take actions in a timely manner and assure the quality of the system. Croatia is part of a trend in the ECA region, where several countries often "operate in the dark," foregoing the chance to systematically collect data on student learning outcomes. Similarly, because of over-reliance on legislation as the solution to most problems, instead of a greater focus on what makes implementation feasible, "softer" policy instruments, such as incentives, per-student funding, different management approaches, building capacity, nudging, or using evidence to build broader stakeholder support are underutilized. While almost all countries in the region have introduced per student financing to incentivize local actors to downsize their network of schools in response to falling student numbers, Croatia still finances inputs (e.g. teachers).

[106] UNESCO Institute for Statistics, accessed October 2018

Challenge 7: **Limited use of modern public sector management approaches limits autonomy of local actors and efficiency of the system** – The Croatian education system is still run according to detailed and centralized norms, which limit the autonomy of local authorities in many ways. Schools, cities and municipalities must follow centrally determined norms specifying the number of cleaning personnel, cooks (1 per 75 hot meals prepared), janitors, school accountants, and librarians to be hired per school, which impede local solutions that may be more appropriate and cost-effective.

3.1.3 VET, Adult Education and Lifelong Learning: outdated VET programs disconnected from the needs of employers and low emphasis on adult education exacerbate skills mismatches

Challenge 1: **Limited strategic planning at the national level impairs better system performance–** Limited strategic planning and coordination at the national level about VET and adult education program offerings that do not result in binding policies at the regional and local levels contribute to the poor use of available data to inform decisions and to haphazard decisions about the type, location and timing of course offerings (resulting in overlap of courses, oversaturation of graduates in certain areas and lack of professionals in others), among others.

Challenge 2: **VET Programs are outdated, low quality and misaligned with employers' demands –** Outdated VET programs are at the center of the mismatch between the supply of skills and the demands of the labor market. Despite recent progress in certain domains, the engagement between employers and VET schools remains limited. At the same time that unemployment is high, employers in specific segments of the economy, such as construction, tourism, transport, food industry and agriculture and forestry cannot find candidates to fill their vacancies, with some resorting to foreign workers to meet their needs. Opportunities for WBL are inadequate to properly prepare students for jobs, especially those entering the labor market after completing their VET training. While sector profiles that are more closely aligned with the needs of employers have been created for certain areas, many of these changes are yet to reach students. The quality of teachers and equipment also directly impacts the relevance of current VET programs. A direct consequence of the inadequate quality and relevance of VET offerings is the slow transition from school to work seen in Croatia. VET programs often are less prestigious than the general education track and sometimes have a poor image among students and families. The performance of VET students in international assessments is lower than of students in general education. The plan to reduce the weight and number of general education subjects in VET programs by the new reform raises concerns.

Challenge 3: **3-year VET Programs face lower demand from students and are vulnerable to underinvestment – In** addition to the general challenges faced by VET programs, 3-year courses are struggling to attract students, are unable to secure WBL opportunities with employers at the rate and length needed, are particularly vulnerable to underinvestment (e.g., greater need for up-to-date equipment and materials), enjoy a more negative image among the population and have quotas that have not been adjusted to account for the demographic decline. Three-year programs often attract students with the lowest academic performance, who often are from disadvantaged backgrounds, who perform more poorly in standardized assessments like PISA and who find it harder to obtain employment upon graduation when more qualified candidates are available or to continue their studies into HE, reflecting the inequity of opportunities within the system. While 3-year VET courses also attracted students with a similar background in the past, given the smaller overall cohorts of students in recent years, demand for 3-year programs has plummeted more than other courses, leading to labor market skills shortages in some fields. Several factors contribute to the low attractiveness of these programs, including limited opportunities to continue education at the HE level.

Challenge 4: **The competencies of VET and adult education teachers are often outdated and disconnected from the current needs and practices of the vocational field in which they are teaching** –Some teachers also lack pedagogical training, which is not equally available throughout the country and is not mandatory for adult education teachers in Croatia. The challenges and needs in this area are several, and include:

- Increased participation by teachers in professional development
- Greater availability and relevance of professional development content and materials
- Higher quality of professional development processes
- Harmonization of national priorities and training based on the needs of teachers and schools, including better definition of long-term objectives for VET training
- Mechanisms to improve teachers' motivation related to professional development
- Improved teacher advancement system
- Availability of a simple model of pedagogical training for mentors to strengthen employers' capacity to receive students for WBL

Challenge 5: **Participation of Croatians in lifelong learning activities is one of the lowest in the EU –**This is most acute for those with the lowest levels of education and the long-term unemployed. These low levels of engagement in learning throughout life and more specifically during adulthood, contribute to outdated skills, which are associated with low labor force participation and low productivity.

Challenge 6: **Great variation exists in the quality of adult education offerings and low participation of employers in the design of qualifications –** The country has a vague certification framework and lacks quality assurance mechanisms to monitor and improve offerings; the proliferation of providers and programs makes using and managing the system difficult for users and training authorities – a large number of adult education institutions carry out an extremely large number of programs from different educational sectors, which jeopardizes the quality of education. With the rapid population decline, workers of all ages will have to become more productive throughout their lives for the country to maintain its standard of living – without quality opportunities for re-skilling at an adult age, this task becomes increasingly challenging.

3.1.4 Higher Education and Science: Ineffective quality assurance and monitoring, incomplete reform of public research institutions, and limited capacity of and cooperation between the public and private sectors contribute to lackluster performance

Higher Education

Challenge 1: **University structure and** the **legal framework prevent the implementation of modern policies –** The addition of important new regulations on quality assurance (2009), CROQF (2013), and the introduction of funding agreements (2012) to the fundamental Act on Scientific Activity and Higher Education (2003) has created a complex legal framework with a multitude of governing and expert bodies that have proved inefficient. This prevents the implementation of modern policies. Currently, each faculty within non-integrated universities has legal autonomy. This creates a multitude of legal entities, which is an obstacle to efficient strategic and financial management within the HE system.

***Challenge 2:* Croatia faces very low HE attainment rates –** Very low HE attainment rates,[107] at 29 percent in 2017 against the EU average and ET2020 goal of 40 percent, raise concerns. Decreasing attainment rates and stagnation in HE enrollment suggest that many students do not complete their studies or take longer than expected to do so. These very low attainment rates exist in a context where the country urgently needs to increase the "production" of higher skilled workers, such as engineers. Since the HE attainment rate depends on both widening participation and completion, MSE has implemented policy instruments to stimulate both. However, as a result of the lack of a monitoring and evaluating system with quantitative targets on dropout and completion rates, tracking of their effectiveness is currently impossible. The National Group for the Enhancement of Social Dimension in HE has identified 15 categories of underrepresented groups of students who face challenges to access HE or are at a dropout risk. Direct and indirect financial incentives set to stimulate student progression are merit-based and tied to the accumulation of ECTS credits, which is an equity concern for disadvantaged students. The latest policy developments in this area encourage need-based incentives but it is necessary to continue the development and implementation of these incentives. In the HE system, part-time students are not eligible for any state support, which discourages wider participation in, and successful completion of, HE for this large student group (28 percent of student body). Also, there is a need to adjust study program delivery to part-time students' needs so that they are able to better combine study and work. Since Croatia faces a significant emigration wave, it would be wise to conduct research on the impact of high-skilled emigration on HE attainment rates and on equity policies. Currently there is no data available on these issues.

***Challenge 3:* Employability rate of recent graduates is low –** Low employability rates – 72 percent in 2017 against the EU average of 85 percent and ET2020 goal of 82 percent[108] – suggests that graduates' competencies are not sufficiently relevant for labor market needs. This is a consequence of deficiencies in the curriculum design, which is not systematically informed by the current and future needs of the economy and society. Students need better support in their transition to work. The high qualification-occupation mismatch for bachelor's graduates (30 percent)[109] and high share of master's graduates (45 percent) may indicate a structural problem within the Bologna degree structure implementation in Croatia, because the labor market might not adequately recognize bachelor's degree qualifications.

***Challenge 4:* Existing mechanisms to ensure quality of HE remain insufficient, failing to enhance the relevance of study programs** – Existing mechanisms to ensure quality of HE remain insufficient, failing to enhance the relevance of study programs. The low employability rate of graduates, the high qualification mismatch for bachelor's graduates, and the low level of student satisfaction with study programs[110] suggest that both internal and external quality assurance have not contributed to enhancing the relevance of study programs. There are no structural links between qualification and occupation standards in the CROQF on one side and the initial accreditation of study programs as well as the reaccreditation of TE institutions on the other side. Expected learning outcomes and profiles of study programs do not match labor market and societal needs. The first reaccreditation cycle (2010-2015) primarily focused on assessing the quality of the entire HE institution, rather than on their study programs.[111]

[107] Refers to the population aged 30-34 that have successfully completed tertiary education (ISCED 5-8)
[108] Refers to the graduates (ISCED 5-8) aged 20-34 who had graduated within the previous three years
[109] European Commission, 2017b
[110] Šćukanec et al., 2016
[111] NCHPD, 2015

Science

Challenge 5: Coherent monitoring **and evaluation of funding policies have yet to be established –** Despite two 3-year cycles of funding agreements with HE institutions since 2012, MSE did not manage to establish a coherent monitoring and evaluation system able to assess funding effectiveness. Since linear tuition fee involves high risks in terms of financial planning (difficult to predict student success in ECTS accumulation) and equity, its ultimate strengths and weaknesses remain obscure. The state has made no progress in redirecting indirect subsidies for meals available to all students into direct scholarships for those most in need. Ever increasing high-skilled emigration is a potential challenge for the effectiveness of public spending on the student support system. Further research is needed on the influence of high-skilled emigration on HE.

Challenge 6: **The process of restructuring and consolidating public research organizations has not been completed as planned –** The partial restructuring of the research sector has resulted in the fragmentation of public research organizations, without bringing about the required renewal of the research infrastructure and increases in research funding. As seen, Croatia has 25 public research institutes, compared to, on average fewer than 5 research institutes in most Scandinavian countries. Some of the main challenges PROs are currently facing include limited autonomy (including the definition procedures related to career advancement and awarding of productive researchers), scarce budgets, obsolete infrastructure, inability to efficiently respond to the needs of the economy and lack of focused long-term development strategies. Grants for investing in R&D infrastructures designed by MSE require the implementation of organizational reform of the PROs' organization as a grant beneficiary, which should bring about improvements in PROs' organization and management in the long-term. In addition, beneficiaries are required to elaborate and document the need for new equipment to be funded through ESIF grants, as well as to explain conditions for access to the supported infrastructure by other research organizations. These procedures should lead to a more efficient distribution of research equipment among different organizations and decrease the operating costs of the purchased equipment. Additional efforts should be made to catalog capital research equipment at research organizations and ensure open access to all interested stakeholders under the same conditions.

Challenge 7: **Access to finance for RDI is very limited –** With limited resources from the state budget and insufficient competitiveness at the EU level, ESIF funds are becoming increasingly important for the entire research community. These are mostly limited to grants, while other types of incentives are scarce or non-existent (e.g., venture capital funds, public procurement for innovative products and services, tax reliefs). Financing for RDI should enhance capacities for collaboration throughout the whole research and innovation chain, which might create future growth opportunities and in turn attract private investments. Calls for project proposals would benefit from further simplification of administrative procedures and selection criteria. Funding of research infrastructures is focused on project documentation, construction and equipment purchase, project management and accompanying activities. Organizational reform is also facilitated, and its components can be financed from other OPCC 2014-2020 calls, as well as by complementary funding for human resources development in science, such as OPHRD 2014-2020, Croatian Science Foundation calls and bilateral co-operation projects. The monitoring and evaluation of these mechanisms and their impact is necessary to identify any gaps and design improvements that would facilitate the smooth operation of new infrastructures.

Challenge 8: **Capacity of public and private sectors for RDI is low –** Public research organizations are still scarcely visible and uncompetitive in the international context. Croatia's research excellence composite indicator score is low compared to other EU countries; the number of public-private co-publications decreased relative to the EU in 2010, from 87 percent in 2010 to only 66 percent in 2017; scientific production in prestigious journals is among the lowest in the EU; while performance in

Patent Cooperation Treaty (PCT) patent applications has also decreased in relation to the EU average.[112] In large universities, faculties are considered separate legal entities with a high level of autonomy. This type of organization prevents universities from creating and efficiently implementing development strategies, from responding to changes in the environment and from building their competitiveness and visibility in international contexts. The evaluation system for institutional research performance is relatively weak. Procedures for the hiring and advancement of scientists often do not reflect research productivity, excellence or project success. Procedures are slow and cumbersome, significantly hinder mobility both within institutions and from external institutions, and have poor mechanisms for motivating the best researchers or addressing the poorly performing ones. Science-industry cooperation is still at low levels, despite new ESIF-funded programs. Croatian companies rarely invest in RDI (0.38 percent of GDP in 2016), while the business environment in Croatia does not facilitate innovation efficiently, primarily due to lack of a systematic approach and coordination in the design and implementation of instruments supporting innovation development. New measures aimed at ensuring a more systematic approach to facilitate innovation include the establishment of the National Innovation Council (NIC) in July 2018. NIC is envisaged, within the Smart Specialization Strategy (S3), as the highest body responsible for coordinating the implementation **of the S3 Strategy for the period 2016-2020.**

Challenge 9: The national **innovation system lacks a coherent and integrated policy framework** –The recent RIO Country report 2017 for Croatia,[113] along with several other reports and analyses, indicates that the Croatian innovation system lacks a coherent and integrated policy framework. The implementation of policies and measures that promote system reform defined within main strategic documents, such as the S3,[114] the Innovation Strategy,[115] and the Strategy for Education, Science and Technology,[116] has been largely delayed, can be narrow in scope and sometimes does not demonstrate commitment. The European Commission[117] states that "policy responsibilities in support of science and innovation appear uncoordinated, which weakens the implementation of the policy strategy". These circumstances, along with common delays of project proposals' evaluation procedures, make it difficult for PROs to efficiently plan their activities or financial inflows and outflows. Moreover, the evaluation culture remains weak in Croatia. Instead of focusing on effectiveness and efficiency, and on creating conditions that are helpful to RDI performers (as key parts of the system), there seems to be a focus on top-down interventions and administrative procedures. A national innovation system as designed by the S3 strategy and Innovation Strategy is currently being developed. There are plans related to the systematic collection of data and analysis of impact and results of individual instruments that have already been implemented, which should inform improvements to the relevant strategies and measures. Results of reforms initiated over the last several years are expected to become visible in the coming years, but efficient and continuous monitoring and evaluation will be key to meet the needs of NIS stakeholders and adapt to contextual changes.

[112] European Commission, n.d.
[113] European Commission, n.d.
2018.
[114] Ministry of Economy, n.d. (a)
[115] Ministry of Economy, n.d. (b)
[116] Ministry of Science and Education, n.d.
[117] European Commission, 2018a

3.2 Opportunities for Development:

3.2.1 Early Childhood Education and Care: Quality of ECEC in general is thought to be adequate and demand for services is high

Opportunity 1: Access to EU funds to expand access to high quality ECEC – Croatia has a chance to improve the learning potential and the life chances of its youngest citizens by making access to high quality pre-primary education universal and making an special effort to include the most disadvantaged children in early learning opportunities. Building high-quality child-friendly education infrastructure often has a lower level of complexity than other actions required to improve access and quality of education and care. Although other efforts to improve quality are also critical, the country's access to EU funds that can continue to be allocated to infrastructure represents a unique opportunity not available to many countries around the world. Securing the "right" to ECEC for every child (governmental responsibility to provide if demanded), which is common in the EU (many countries, including Slovenia, Hungary, Belgium, Italy, France, Finland and the Netherlands guarantee it) but is not the case in Croatia, would also lead to a more equitable and efficient ECEC system.

Opportunity 2: Training and hiring of more ECEC teachers and support professionals to help increase the skills of Croatians – Investing in an ECEC workforce of high quality represents an opportunity to increase the skills of Croatian citizens, which is a national priority. The training and hiring of an efficient number of new teachers and support professionals will also contribute to further reducing unemployment and/or to increasing employment of young professionals, especially in lagging regions. A potential source of candidates that could be explored is excess teachers from the primary and secondary levels (see decreasing student-teacher ratios in primary and secondary education). Also, agreement on pathways to recognize prior learning could be useful. The training of a large number of new teachers also represents a chance to focus more intentionally on issues of inclusiveness in their training. Finally, the discussions about increasing the cohort of ECEC teachers might also represent an opportunity to move forward with professional licensing and relicensing policies to raise the quality of the ECEC workforce, including that of principals.

Opportunity 3: Level the playing field for all young children – Croatia performs below the EU average in ECEC. The country has an opportunity to catch up to EU and international players by starting on the path to free, universal access to ECEC of high quality. Countries usually pay for human capital development one way or another. Investments in early childhood have higher returns on investments than initiatives targeted at older children and adults. Given the comparatively low levels of enrolment in ECEC in Croatia, the country has substantial room to improve and reap the benefits.

Opportunity 4: Space for the national government to play a more strategic role in ECEC – Given marked territorial disparities across towns and municipalities in access to and quality of ECEC, the national government could intensify its strategic role in this subsector by ensuring financial and technical support and compliance of local governments with minimum standards in ECEC operations (e.g., through a strong quality assurance system). In countries where many ECEC tasks have been devolved, it is important that early childhood services be part of a well-conceptualized national policy, with local authorities enjoying devolved power on one hand and a national setting of goals, legislation and regulation, financing, staffing criteria and program standards on the other.[118]

[118] OECD, 2017

Opportunity 5: Synergistic potential of existing evaluation systems – With the purpose of assuring and enhancing the quality of education, it is important to connect the existing forms of external and internal evaluation (as well as develop new ones), and to use their synergistic potential more effectively.

3.2.2 Primary and Secondary Education: Availability of EU funds to move curricula reform forward and smaller student cohorts that put less pressure on infrastructure and human resources

Opportunity 1: Consensus about the need for reform and launch of a pilot – Despite debate on the details of the curricula reform, the fact that the large majority of stakeholders agree on the need to modernize the Croatian education system is positive and should be built upon. Croatia has taken the important first step of launching a pilot of the reform, with a large-scale expansion planned for the coming year. The country will have the opportunity to evaluate the pilot, learning from what worked well and what needs adjustments before revising its strategy and approaches for the scale up.

Opportunity 2: Availability of EU funds –A positive funding environment, with various instruments such as ESIF, SRSP, ESF, etc. available represents a valuable opportunity to advance education improvements on various fronts. Croatia can build on previous positive experiences funded by the EU to push for strong initiatives and for much-needed reforms that can lead to improved learning outcomes and greater prosperity for citizens.

Opportunity 3: Low number of early school leavers – With one of the lowest percentages of early school leavers in the continent and below-EU-average repetition rates, Croatia can build on the fact that nearly all of its children and youth are in school and progressing as expected. Even though there is a room for improvement in learning outcomes, keeping students in school, , is much more efficient than trying to attract students who have dropped out to come back. Improvements to the quality of education are likely to benefit all those in the system if designed appropriately, especially those struggling and at a high risk of dropping out.

Opportunity 4: Smaller student cohorts put less pressure on infrastructure and other resources – While low fertility rates and the migration of workers and families limits potential long-term growth and can affect productivity, on the positive side smaller student cohorts allow for easier implementation of changes and management of the system, more individualized attention from education staff to students, etc. Adjusting teaching staff numbers and other resources related to the decreasing population to an optimal number can also free up resources for investments in other areas.

3.2.3 VET, Adult Education and Lifelong Learning: High participation in VET and the foundations of CROQF to help guide the sector

Opportunity 1: Room to build on national and local strengths in a complementary way – While decentralization of implementation and customization of solutions at the regional and local levels are important and should be preserved, the opportunity for stronger guidance at the national level exists. Those with an understanding of the needs of the job market and demographic changes on a national and regional level, and with national development priorities in mind, especially in a relatively small country like Croatia, could be well positioned to provide direction on sector prioritization, complementarity of course offerings, evaluation of programs, streamlining of adult education providers and courses, and would have a better chance of overcoming eventual resistance to needed reforms at more local levels. Making greater use of formulas to incentivize local actors to perform in a certain way may also present

itself as an untapped opportunity. Using broader regions (beyond counties) could also provide economies of scale and help rationalize offerings (e.g., many counties have cohorts so small - fewer than 2,000, sometimes 1,000 students – that offering a full set of VET programs is not cost-effective).

Opportunity 2: Availability of EU funding and support to VET – Opportunities to increase the contributions of VET to the country's economy and to people's lives exist on various fronts and in general involve improving the overall quality of programs and their connection to the labor market. The availability of EU funding and support to VET, as well as a high percentage of secondary students enrolled in VET, provide an adequate context to focus investment in this area. Opportunities include, among others: modernization of the VET curricula anchored on CROQF, Sector Skills Councils and Sector Profiles and systematically taking into consideration results of skills anticipation and tracer studies; design and implementation of a strategy to encourage, incentivize and make the best use of employers' participation in the design and implementation of VET (and adult education) programs, including through offering greater opportunities for WBL with employers; more effective career guidance to students; and, a public campaign to improve the image of VET (based on concrete improvements in quality).

Opportunity 3: Appropriate context to address the challenges of 3-year VET programs at the national level – Changes to 3-year programs should carefully take into consideration the outlook for employment in this area, as demand for and the content of occupations is likely to change through the years and students are likely to change occupations multiple times throughout their careers. The demand for 21st century skills is likely to increase in all occupations. The current context represents an opportunity to revamp and make the 3-year VET programs leaner, more effective, and attractive. A detailed study is needed of the weaknesses and strengths of these courses and the opportunities in this area, given the shrinking of the population, the absorption capacity of local markets, and the need for stronger hands-on training. At the same time, businesses might not clearly see the benefits of their participation, and study of the actual current skills in demand as well as those expected in the future could help inform the path forward. The possibility of improving the vertical integration of this track with HE should be analyzed. Similarly deserving of attention is the possibility of allowing students to acquire more key competences for lifelong learning and delay specialization into specific occupations (first selecting a broader sector of VET study) until later in their studies, in order for students to acquire more general competencies useful throughout their careers and to more easily transition to HE if desired, which would likely increase the attractiveness of 3-year programs. Options to delay specialization should be investigated. One option could include merging the first year of 3 and 4-year programs, as 4-year programs are already set to contain up to 50 percent of sectoral curricula according to the recently adopted National Curriculum for Vocational Education. This option is unlikely to cause major disruptions as vocational schools often are already organized by sectors, and there is an established practice of joint classes comprised of students attending different programs (in particular with 3-year courses). More general subjects at the start of upper secondary would provide more key competences for lifelong learning and improve learning outcomes related to basic skills, which are in high demand by employers. The selection of a track and course in the second year would still provide sufficient space for work-based learning. Another option for delaying specialization would be to prolong 3-year programs to 4 years, likely attracting more students to these programs. Adding another year to these programs or making the option of an extra year possible (e.g., a prospective cook could choose a 3-year course oriented towards the labor market only, or a 4-year course with more general subjects and the same amount of vocational coursework and work-based learning stretched over the additional year) would increase the emphasis on general subjects and give students the possibility to more easily take the Matura exam. This approach could complement ongoing MSE efforts to reform the general education subjects in VET. When reforming 3-year programs, local concerns about the future of teachers and other professionals currently employed in 3-year programs (e.g., in programs to be discontinued, merged or substantially changed) should be taken into

consideration and a program to retrain or reintegrate these professionals in more effective ways could be considered; however, such concerns should not prevent the required changes to make the programs more relevant and effective from taking place.

Opportunity 4: Existing plans to better prepare Croatian VET teachers – Investing in teachers' development so that it leads to improvements in student learning is a key component of any VET reform. Existing plans to better prepare Croatian VET teachers represent an opportunity in this area. Implementing a program to update teachers' technical skills and pedagogical competencies, and to enhance their motivations and sense of appreciation should be given high priority. Opportunities for teacher immersions with employers would be valuable but might require incentives to attract private firms and defray their costs. Emphasis should also be placed on high quality training programs for teachers at Centers of Competence.

Opportunity 5: Consensus on the need to increase lifelong learning opportunities – A culture of continuous learning and personal development has benefits for both individuals and society. Studies exist in Croatia that describe the main barriers to participation in formal and non-formal learning segmented by age, level of education, employment status, etc. Given that opportunities for adult education are particularly limited for those with the lowest levels of education, and for those who are unemployed or inactive, and considering the importance of improving their skills (in terms of the expected impact on the Croatian economy), this group could be prioritized. High level consensus about the need to address the high number of adult education providers and the extremely high number of programs they offer, represents an opportunity to improve the quality of adult education offered. In addition to lowering barriers for participation, a focus on improving the quality and job relevance of offerings, including continued VET courses targeted at unemployed and employed individuals, would be essential.

Opportunity 6: Existing strategic framework to promote lifelong learning in Croatia – This framework emphasizes adult education and proposes important actions to improve its relevance can be seen as an opportunity to build upon. Although some providers participate in self-evaluation processes, room for external evaluations and potentially greater regulation in this sector exists, given the low quality of many programs and the plethora of providers and courses. Setting up a quality assurance system to clearly monitor and address the courses being offered and those who are offering them, would be critical. Targeting courses to youth, low-skilled workers and the long-term unemployed is likely to bring the largest benefits but such efforts need to be coupled with initiatives that enhance learning opportunities for those already employed, so that productivity can be increased.

3.2.4 Higher Education and Science: Existence of a national plan for equity in HE, CROQF as reference and data collected for and experience with EU funding, and availability of ESIF funding and public sector prevalence in this segment that could facilitate changes

Higher Education

Opportunity 1: Existence of a National Plan for the Enhancement of Social Dimension in HE – The development of the *National Plan for the Enhancement of Social Dimension in HE 2018-2021* represents an opportunity for the continuous systematic increase of HE attainment and equity. The plan includes policy instruments for improved data management, quantitative indicators, instruments for improved access and increased retention, completion, and employment rates. It introduces an enhanced system for HE funding. Although these instruments focus on disadvantaged learners, they will enhance the quality of studies for all students.

Opportunity 2: CROQF as reference to guide improvements to the relevance of qualifications and study programs – CROQF links many of the structural reform tools in HE that could raise graduate

employability: it promotes comparability and transparency of qualifications within and across countries, and increases the relevance of learning outcomes and of the ECTS credit system, refining the degree structure and quality assurance mechanism. CROQF provides an opportunity for the integrated management of various policy instruments that would secure the relevance of qualifications and study programs. To ensure better results in raising employability rates, graduates' transition into the labor market should be monitored through a graduate tracking system.

Opportunity 3: Data and experience in implementing funding agreements – The wealth of collected data and experience from the previous two cycles of the implementation of funding agreements should inform a new generation of funding agreements after 2018. The Government plans to use EU technical assistance, peer counseling, and EU funds to develop a robust and strategically driven funding system.[119] The current recovery of economic growth presents an opportunity to increase public expenditure for HE to reach the EU average, a necessary step to implement strategic goals.[120] The high public returns to HE should facilitate such increases. The current economic situation also represents an opportunity to increase collaboration with the private sector and the labor market more broadly to help increase the employability of graduates. The development of funding policies, particularly the design of a student support system, should consider the effects of high-skilled emigration on HE and on other public policies.

Science

Opportunity 4: Existence of a national and EU strategic framework for HE and the Bologna process comparative analysis – The current national and EU strategic framework for HE, together with the Bologna process comparative analysis, provide a basis for creating a new main act in the field of science and higher education. As foreseen by the strategic plan of MSE for the period 2019-2021, the new Act should contribute to the increase of competitiveness, relevance, and excellence of public research organizations and public universities. It should as well improve the method of their governance and selection of leadership positions, improve the quality of studies at all levels of higher education, contribute to a more stimulating environment for the participation of researchers in international competitive projects and improve cooperation of science, higher education, economy. Further, the new Act should introduce a more transparent and more flexible system for hiring and promotion to replace the extremely rigid system in place today, it should allow for extensive mobility within institutions and from outside institutions, international experience and project success should be recognized and encouraged, transparent methods to award (promotion-wise and financial-wise) the most successful researchers should be introduced while at the same time methods to address the poorly performing staff should also be implemented, and cooperation with industry as well as with local communities should be recognized in hiring and promotion criteria. A performance-based system for financing the public universities and PROs should also be detailed in the new Act, which should also introduce rules on how the institutions use their funds, such as under which conditions, and how, the pay of existing staff should be increased or new staff hired. A lack of flexibility and clarity on the previous points is an important reason for the poor performance of institutions. Croatia already has a sectoral long-term strategy for science, technology and education with specific goals for science and HE.

Opportunity 5: Current efforts to enable efficient collection and analysis of data on RDI funding leading to higher funding absorption – ESIF funding provides an excellent opportunity to increase investments into RDI and achieve both relevant scientific breakthroughs and new products and services,

[119] Government of Croatia, 2018a
[120] File et al., 2013

but the absorption of available funds is not satisfactory. More efficient absorption of ESIF requires efficient short-term and long-term planning of development priorities based on analyses of the actual needs and capacity of potential applicants. Efforts are currently being made to enable efficient collection and analysis of relevant data within the strategic project "Science and Technology Foresight," which focuses on the development of a comprehensive information system of scientific activity with a web-based user interface for input, management and analysis of data. The data is scattered at the moment and this project serves the purpose of gathering every relevant information in one place. The implementation of the project started in 2017 and is expected to be completed by 2021. There are opportunities to design and implement calls for proposals more efficiently by taking into account the relevance of selection criteria, conditions in which proposals are being prepared, business processes of applicants and applicability of defined implementation procedures,. Calls for project proposals would benefit from the further simplification of administrative procedures and selection criteria. However, despite the efforts of national authorities, administrative burdens related to funding from ESIF are high.

Opportunity 6: Potential strategic role of the recipients of major ESI grants – During project implementation, recipients of large ESI grants for investments into research infrastructure and/or RDI projects should work on organizational reform and capacity-building opportunities, which should lead to sustained and improved excellence, relevance and competitiveness of their RDI in Croatia and abroad. The government should actively support networking and internationalization of major RDI performers that receive grants from ESI and Horizon 2020 sources. Otherwise, the effects of these grants on the future research and innovation outputs and on outcomes and policy objectives will likely be limited.

Opportunity 7: Availability of ESIF funding for RDI – ESIF funding should be used efficiently to enable necessary investments into research infrastructures, human resources, internationalization and networking, cooperation between science and industry, as well as fostering scientific excellence and international relevance. Supportive structures, regulations and financial incentives should encourage HE institutions and PROs to align their strategies to national and EU priorities and address societal challenges and needs of businesses. There is a need to additionally support research performers, including recently established organizations (e.g., centers of research excellence and centers of competence) and those who receive funding for research infrastructures, in the areas of internationalization, networking, mobility and cooperation with the private sector. The need for this type of support has been recognized on a national level and implementation of some new supporting mechanisms has been initiated. For example, in 2018 MSE introduced financial support for the preparation of H2020 applications (supporting networking and meetings with project partners from abroad, offering training in project proposal writing and similar activities). Supporting access to international research infrastructures features in the MSE's strategy plan for the period 2019-2021, with the purpose of strengthening research excellence in Croatia (in 2018 Croatia fulfilled conditions for access to CERN for Croatian scientists). MSE also made efforts in supporting the organizational reform of research organizations, as it makes integral part of ESIF grants for research infrastructure investments. Therefore, substantial progress has already been made by the MSE in the area of defining the concept of the organizational reform and emphasizing its importance as an output and obligatory result of funded RDI projects. Additional efforts could be invested into the design and implementation of funding mechanisms supporting organizational reform and capacity building to accompany ESIF grants, which will require cooperation of relevant national authorities. Greater focus should also be put into increasing the visibility of PROs and HE institutions in the private sector and international research community. HE institutions and PROs should take the lead in the modernization of the research and innovation landscape in Croatia, with support from the government. Introduction of new types of organizations more suited for innovation such as research and technology organizations (RTOs) should be made possible. Public sector actors currently play a major role in financing and conducting research in the country. Although this public sector prevalence indicates the relative underdevelopment of business sector RDI activities specifically, and the knowledge-based

economy in general, such conditions can also be used as an opportunity to act and facilitate change. The government should provide supportive structures, regulations and financial incentives that will steer HE institutions and PROs to better understand, address and serve the needs of their stakeholders. Leveraging the RDI potential of the private sector will require improving the country's competitiveness and business climate.

Opportunity 8: Experience from 2007-2013 and 2014-2020 programming periods and finalized evaluations – The experiences acquired through the programming and implementation of measures related to the 2007-2013 and 2014-2020 programing periods, combined with the results of finalized and planned evaluations (and general strengthening of the evaluation culture) could be used to improve future efficiency. Although the impact of research and innovation can only be adequately measured over a longer period of time, the available evidence can still be useful in policy development and programming for the period 2021-2027. Detailed action and financial plans should accompany each strategic document, with carefully defined responsible bodies and annual budgets. Implementation of defined measures should be efficiently evaluated and monitored, with mechanisms to enable fast response to significant changes. The measures should (at least in the medium-term period) involve structural reforms rather than just administrative issues and ESIF funding. Funding schemes arising from the policy framework should be subject to comprehensive ex-ante and ex-post evaluations and implemented with efficient monitoring systems in order to evaluate results and problems in all schemes and to enable their continuous upgrades and improvements.

4 4. Prioritized Policy Recommendations

4.1 Primary and Secondary Education: Optimize the school network to improve efficiency and allow for increased instruction time and prioritize equity and quality-enhancing measures

1) Increase instruction time by raising the number of hours in the school day or making compulsory education longer, through adopting the required adjustments in the curricula

- Problem – Student learning outcomes are poor for a significant percentage of students. At the same time, instruction time in Croatia is one of the shortest in the EU. Although the 2014 Strategy for Education, Science and Research prescribed changes to the structure of compulsory education, preconditions for these changes (e.g., availability of physical space) are not in place.
- Approach – Increase the length of the school day, moving Croatia to a whole-day school system, or increase the number of years in primary education. Implementation of this policy would affect all stakeholders in the education process, including institutions for teacher education, teachers and educational staff at the local and national levels, and students. Some of the resources needed would include adequate infrastructure to accommodate students during a longer school day (in case this is the option chosen), new and revised subject curricula, ensuring there is an appropriate number of teachers equipped with the right competencies to teach the new curricula, etc.
- Required action
    - Short–term actions:
        - Learn from other EU countries that have increased instruction time
        - Define a strategy to increase instruction time in Croatia, including paying attention to the financial implications, political feasibility, and evidence-base for desired outcomes
        - Start addressing constraints to implementation of whole-day schools or adding an additional year to primary education (physical and human resources)
        - Run a pilot of increased instruction time
        - Secure additional funds to scale up the initiative
    - Medium–term actions:
        - Implement changes at a nationwide basis allowing all children to receive increased instruction time (e.g., change legislation, complete revision of the curricula, secure adequate number of trained teachers, etc.)
    - Long-term actions:
        - Ensure continuous improvement of extended instruction time to lead to improved student learning outcomes

- Risk management – lack of sustained political support for the reform, slow policy implementation, inadequate financial resources. Mitigation should include evidence-based policy implementation, use of incentives and other soft instruments to incentivize change, strategic resource allocation.

2) Optimize the school network to improve efficiency and allow for increased instruction time

- Problem – Inadequate school network on a national level: on one hand, a large number of schools are still running dual shifts, making it impossible, even if other conditions were in place, to increase instructional time through longer school days; on the other hand, the number of small schools – operating with smaller and smaller class sizes – is growing. These schools are expensive to operate (on a per student basis) and are struggling to attract and retain high caliber staff.
- Approach – Perform a detailed analysis of the current school network and identify opportunities for greater efficiency in the school system
- Required action

  Short-term actions:

  - Perform detailed analysis of strengths, weaknesses, challenges and opportunities associated with reduction/elimination of double/triple shifts in schools given the current and expected size of school cohorts
  - Benchmark EU and international experiences related to moving to a single school shift
  - Develop a strategy to streamline the school network, focusing on the implementation of necessary changes
  - Run and evaluate pilot
  - Enact legislation to ensure changes to the school network are done according to efficient parameters

  Medium-term actions:

  - Implement changes nationwide
- Risk management – Lack of political consensus and capital to implement changes at the regional and local level. Lack of financial resources. Mitigation to include evidence-based policy, strategic resource allocation, use of modern policy instruments such as incentives and capacity building, reinforced link between budget and policy on a national, local and regional level.

3) Address equity issues and strengthen support to struggling students to improve learning outcomes

- Problem –A high percentage of Croatian secondary students performs at low levels according to PISA results. Although data on student learning outcomes at the primary level is not available, it is unlikely that the situation is much different. Socio-economic background is still the most important factor that impacts learning outcomes. Students from the lowest wealth quintiles attend ECEC in much fewer numbers but are the ones with potential to benefit the most from it. There is inadequate family and institutional support for struggling students, those at risk, and migrant students.

- Approach – Create new and strengthen the implementation of existing programs and actions to improve equity in primary and secondary education (which for improved results involves the need for greater participation of disadvantaged students in ECEC). Invest in professional development for teachers working with at risk students. Improve the quality of VET education, which is chosen by a high percentage of students from lower SES.
- Required action

  Short-term actions:

  - Expand and strengthen programs for low performing students and students at risk
  - Improve identification of struggling and at-risk students through better collection and use of data (e.g., standardized assessments at different points of the education cycle)

  Medium-term actions:

  - Prioritize disadvantaged students when increasing access to ECEC
  - Develop and implement a comprehensive, robust support system for all students performing at the lowest levels, as well as for other disadvantaged students, with clear goals to improve learning outcomes
- Risk management – Lack of political priority and allocated financial resources. Lack of public understanding of positive impact of more inclusive policies. Mitigation actions could include evidence-based policy implementation, strategic resource allocation, reinforced link between budget and policy and teacher support mechanisms.

4) Improve curricula and teaching practices by prioritizing implementation of the curricula reform

- Problem – Outdated curricula and inadequate teaching practices contribute to lower learning outcomes. The curricula reform, which is supposed to help address these problems is very delayed and has become narrower in scope than anticipated. Teacher preparation to implement reform goals has started but in certain cases has been inadequate. Proposed methods of evaluation system for the reform are biased towards capturing successful results.
- Approach – Invest political and financial capital to accelerate the reform, learn from the ongoing pilot and scale up the quality.
- Required action

  Short-term actions:

  - Improve preparation of teachers (including teachers working in boravak)[121] and ensure extra support to all schools participating in the pilot – work with universities and other pedagogic institutions to accomplish this
  - Ensure adequate, updated textbooks are available to all students

[121] Produženi boravak: classes organized after school held by primary school teachers. Specific organizational form, paid by local goverment when there is a need for primary school students to stay in school for a longer time. Usually grades 1 – 3. Organized during the afternoon in schools (until 5 pm). Students attend: organized teaching and homework writing, review sessions, lunch, extracurricukar activities, activities in the field of language aquisition, culture and art, among others. Curriculum planning and execution done by primary school teachers (MEd).

- Ensure objective, external evaluation of the pilot and make adjustments before scaling up the initiative
- Develop and approve the implementation plan for the reform to improve transparency and allow for better planning and monitoring
- Ensure that resources necessary for implementation – EU funds as well as national budget – remain available

Medium-term actions:

- Ensure high-quality implementation of scale up, with sustained focus on teacher preparation and support
- Evaluate outcomes of the reform and act on evidence from evaluation
- Implement classroom observation tools to help teachers improve instruction and focus on critical thinking and problem-solving skills instead of over-emphasizing more rote knowledge acquisition

Long-term actions:

- Strengthen continuous professional development for teachers to ensure engaging, student-centric lessons

- Risk management – Lack of political will and institutional support. Lack of adequate funding. Mitigation to include clearly allocating financial resources to support the reform.

5) Adopt teacher policies that support improved learning and greater efficiency

- Problem – Attracting and retaining STEM teachers has become a challenge at a time when student performance in Math and Science, as measured by PISA, is concerning, especially for those who can be considered functionally innumerate. To compound the problem, graduation from STEM fields in tertiary education is below the EU average (22 percent in Croatia versus 25 percent in the EU46) and shows large differences between males and females (with more males than females choosing the field).[122] As noted in the Croatia Country Gender Assessment "Croatian women lag significantly behind men when it comes to graduating from most of the STEM fields (science, technology, engineering, mathematics)" (p. 73).[123]
- The low attractiveness of the teaching profession, in terms of compensation, opportunity for development and status turn away high caliber candidates who find better opportunities and higher prestige in other sectors of the economy. Lack of a national qualification framework affects the quality of teacher education, while there is room for improvements in the professional development of teacher trainers at the Agency for VET and Adult Education (ASOO) and at the Education and Teacher Training Agency (AZOO). Smaller cohorts have not led to commensurate adjustments in teaching staff, so many classrooms operate with very low student-teacher ratios, without an accompanying degree of improvement in learning outcomes, tying up important resources.

[122] World Bank, 2018e
[123] World Bank, 2019

- Approach – Look at Croatia's teacher corps to identify areas for greater efficiency and opportunities to improve instruction. Ways to attract and retain higher numbers of STEM teachers of high caliber, including women, should also be prioritized.
- Required action

  Short-term actions:

  - Conduct a detailed analysis of teacher numbers, allocation, shortages, etc. comparing it with current and forecasted needs, taking into consideration potential changes in policy scenarios (e.g. shift to whole day schooling)
  - Act on the most critical and beneficial issues unearthed by the teacher analysis
  - Make a concerted effort to attract STEM teachers, including identifying alternative sourcing channels and looking at the experience of other EU countries
  - Strengthen the professional development of teacher trainers at ASOO and AZOO.

  Medium-term actions:

  - Adopt a national qualifications framework for the teaching profession
  - Reform key elements of the teaching profession that will make it more attractive to high caliber candidates (e.g., more competitive selection process, better wages and/or benefits, high quality, paid professional development, attractive career progression options, etc.)
  - Pilot and evaluate a classroom observation program as part of teachers' professional development
  - Institutionalize measures to attract promising candidates to the teaching profession

  Long-term actions:

  - Scale up classroom observation programs in a positive, supportive culture for teachers, with close monitoring of student outcomes
- Risk management – Lack of allocated resources as well as political agreement on making the teaching profession more prestigious. Mitigation measures could include evidence-based policy for budget planning, reallocation of existing resources, public campaign on teachers.

6) Make greater use of data to inform policy-making and employ soft policy instruments to support reform implementation

- Problem – Limited data exist on student learning outcomes, as the Matura exam is the only external, national evaluation in the country and does not emphasize critical thinking, problem solving and other 21st century skills. It also only comes at the end of a student's secondary education, with no information available about the quality of the system at other levels of education (primary, lower secondary). Furthermore, in general, evidence is not used to the extent possible to inform policies. Also, a strong reliance on legislation to correct problems and induce desired actions is ineffective when the time comes to implement changes. Other methods and instruments, such as incentives, funding formulas, different management approaches, etc. are not deployed on a systematic basis.
- Approach – Implement standardized assessments at other points in time (e.g., 4th grade) to collect valuable data about student learning (use CROQF as a reference), start collecting and

using data and other policymaking instruments on a more systematic way to build stakeholder support and advance policy options.

- Required action

  Short-term actions:

  - Define a strategy to implement additional standardized assessments in primary and/or lower secondary education and an action plan to roll it out, analyzing pros and cons of a sample-based approach vs. mandatory examination for all students, carefully planning for additional data to be collected along with the examination (e.g., socio-economic data, ECEC information, etc. as in PISA) to allow for a detailed analysis of results, and establishing procedures to inform decision making at the policy level of the results stemming from the data collected and improve instruction and support for struggling students at the local level
  - Change legislation about student assessments as required
  - Conduct other studies in areas of the system that could benefit the most from additional data to inform policy making (candidates might include optimal level of teachers (see above) and the key factors influencing and holding back student performance in PISA)
  - Start using modern policy tools to nudge behavior in desired directions with greater frequency

  Medium-term actions:

  - Implement standardized assessments in other points of the education cycle and use data to improve learning
  - Implement changes based on data from studies on key topics for the Croatian education sector
  - Implement learning analytics and educational data mining systems to gather and analyze data to improve learning and inform policy making

  Long-term actions:

  - Revise curricula, target teacher training, improve detection system for at-risk students based on results of standardized tests and other data collection methods
  - Explore and implement innovative solutions and technologies, such as artificial intelligence, to improve learning and inform policy-making

- Risk management – Lack of political consensus and funding, low levels of political capital to implement potentially unpopular polices based on data results. Mitigation measures might include building support for policies based on the wide dissemination of data, strategic resource allocation, reinforced links between budget and policy.

Box 2: National examinations in Slovenia

Slovenia assesses its students through compulsory national examinations at the end of grades 6, 9 and 13. While results do not impact student grades, they are used as additional information about students' learning. Math and the mother tongue are mandatory in all exams. During the 6th grade students are also assessed in a foreign language. During 9th grade the third subject of assessment is a foreign language, or another subject chosen by the ministry of education. The Matura exam at the end of upper secondary education, in its general version, includes five subjects (Math, Slovenian (Italian/Hungarian) and a foreign language are compulsory, while the other two subjects are chosen by students from an approved list). Those who successfully pass it are granted access to HE. Students who have successfully completed a technical upper-secondary education program take a vocational Matura. This is a final examination taken before a school examination committee that may contain external professionals as nominated by the competent chamber of employers and representative unions, as well as teachers. The vocational Matura is divided into two parts: a compulsory part (mother tongue and a theoretical-technical subject) and an electives part (Math or a foreign language, plus a seminar, product or service with oral presentation to demonstrate the practical skills for a chosen occupation). Successful candidates can enroll in professional HE programs or short-cycle higher vocational programs (students may pursue their studies in certain academic HE programs, but they first have to pass another exam in one of the general Matura subjects). The general Matura also grants access to higher education to adults who have either dropped out of education or whose prior education does not allow them to enroll in HE.

Schools use national exam information to organize remedial classes for students who require learning assistance and supplementary classes for students who exceed the prescribed knowledge standards. National examinations have the objective of helping improve the quality of teaching and learning, aiming to promote better student outcomes.

Source: Ministry of Education, Science and Sport of the Republic of Slovenia, 2017

7) Increase autonomy to local education authorities and schools, accompanied by greater accountability for results

- Problem – The education sector is managed according to detailed and centralized norms that leave limited room for local authorities to customize solutions to the needs of their students, leading to higher costs and other inefficiencies
- Approach – Grant greater autonomy through the relaxation of some norms along with increases in accountability, when needed
- Required action –

  Short-term actions:

  - Review all rules that schools and local authorities must follow and assess which ones can be altered to allow more flexibility to local levels without compromising results; find ways of increasing accountability for desired results when needed
  - Build capacity at local levels to ensure ability to handle new responsibilities and focus on desired results
  - Use incentives and other tools to nudge behavior that is likely to result in better outcomes
  - Strengthen monitoring to identify problems with the divestment of authority and other difficulties that get in the way of better results
- Medium-term actions:

  - Increasingly delegate more responsibilities to schools and local authorities based on experiences in the short-term

- Risk Management – Delegation of responsibility is not matched by increased capacity building and accountability. Mitigate by developing, communicating and implementing a plan to delegate authority to local levels, including associated measures; share best practices and create a culture that values high performance.

4.2 Policy Recommendations for Early Childhood Education and Care; VET, Adult Education and Lifelong Learning; Higher Education and Science

4.2.1 Short-term (1-3 years)

4.2.1.1 Early Childhood Education and Care

1) Secure required infrastructure to move towards universal access to ECEC for 4-6-year olds and access to at least 33 percent of children up to 3 years of age.

- Problem - Insufficient number of openings in ECEC programs due to lack of physical space, among other factors; lack of coordination and evidence-based strategic planning at the local, regional and national levels regarding plans for new kindergartens
- Approach - Build new kindergartens, expand the capacity of existing ones, and identify alternative locations taking into consideration current gaps in coverage at the regional and local levels, forecasts of population decreases, and making use of the capacity of private providers.
- Required action - Create a national plan to increase ECEC infrastructure based on current coverage data and existing demand, population studies and potential to repurpose existing infrastructure. Involve local governments and communities through the use of locally available data, but plan for expansion at the national level based on regional needs, while still ensuring the desired maximum distance among centers. In smaller communities or sparsely populated regions, aim to use existing school facilities (including recently closed ones) for improving spatial availability of ECEC close to people's residences.
- Risks management - Lack of funding for expansion of ECEC infrastructure and proper maintenance thereafter. Pressure in some areas to keep decision-making about new kindergartens decentralized, with minimum involvement from national government. Consider all funding options, including from World Bank; for running expenses, central government transfers to poorer towns and municipalities will likely be required. Ensure local knowledge is taken into consideration when making decisions at the national level and communicate this appropriately.

2) Adopt key teacher policies to secure sufficient number and quality of teachers and supporting professionals and administrators in ECEC

- Problem – A shortage of teachers and to a lesser degree, other ECEC professionals such as psychologists, special education teachers, pedagogues, and medical staff, is expected in the

next few years and will become s more significant issue with the expansion of the ECEC system. Lack of transparency in the selection of administrators in some areas and of incentives for teachers' continuous professional development.

- Approach – Train and recruit sufficient ECEC teachers and support professionals to ensure expansion and accessibility of ECEC system. Consider sourcing future ECEC teachers from excess teachers at the primary and secondary levels.
- Required action – Conduct detailed human resources forecasting and planning exercise for the next decade (and onwards), increase the capacity of university teaching programs to prepare a significantly larger number of teachers in a short period, design and implement a strategy to attract future teachers and associated professionals, with special consideration to regions that will receive new kindergartens and for the contracting of teachers from minority backgrounds.
- Risk management – Inability to attract enough qualified candidates, especially for rural and less developed areas. Central government to work with towns and municipalities to create special package of incentives (accommodation support, stipend, etc.) for teachers and support professionals to work in less developed areas, with centralization of decision-making on compensation as a target.

3) Increase equity in access and quality of ECEC for disadvantaged children

- Problem – Systemic obstacles, such as fewer ECEC providers and facilities in certain areas of the country, less favorable criteria for enrollment (e.g., children of unemployed parents), unaffordable fees for children from disadvantaged groups to enroll in ECEC; lack of awareness about the benefits of ECEC among those who could benefit the most.
- Approach – Implement an explicit strategy to reduce inequity in ECEC, including prioritizing new kindergartens in areas of greatest need, removing criteria that disadvantages children of unemployed parents, children with special needs, minorities, etc., subsidize ECEC spots for lower income children at a higher rate to reduce family contributions, and evaluate the need for more holistic programs that specifically target the needs of disadvantaged and minority families. Investments in pre-primary education of high quality for disadvantaged children have one of the highest returns on investments in education and should be treated in a strategic manner. Design and implement a sensitization campaign targeted at families from minority groups, from a lower socio-economic status, with children with disabilities and from in rural areas about the importance of ECEC and practical steps on how to enroll their child (once new openings are available). Design and implement support mechanisms to bring the most vulnerable into the system.
- Required action – Use existing evidence and new data to design an ECEC equity action plan and identify its financial requirements, including increasing financial support from national government to the less wealthy towns and municipalities. Establish a maximum fee to be charged to families. Learn from successful local ECEC initiatives targeted at minority and other disadvantaged groups, such as UNICEF's "A Step Towards Inclusion" program implemented in three Croatian counties and designed to address the needs of Roma children and families. Incentives and other mechanisms might include conditional cash transfers, free transportation, hiring of teachers and other staff from minority groups, close relationship with a family engagement professional, among others.
- Risk management – Political inability to change criteria prioritizing families with two working parents. Package of incentives and support for last-to-reach children could be expensive. In a

system that is moving towards the right to ECEC and universal coverage, compromises will be required - equity should be at the center of the reform agenda and should be communicated accordingly to the population. Carefully planned co-funding by national and local government, with high return on investment expected.

Box 3: Comprehensive, high-quality programs for disadvantaged children in the UK and the Netherlands

It is well established that some of the highest impacts of pre-primary school programs are seen on children from disadvantaged backgrounds, who otherwise would not have access to the same level of stimulation and learning offered by high-quality ECEC initiatives. While access to regular, high-quality pre-primary programs can make a difference in the lives of vulnerable children, sometimes a more comprehensive, targeted approach may be required for results to be long lasting. Initiatives in the UK, with the Sure Start project, and in the Netherlands, with a policy called Voor- en Vroegschoolse Educatie (Pre- and Early Primary School Education; VVE), are intended to link pre-primary education with other services required by disadvantaged families. Sure Start, modeled after Head Start in the United States, includes in addition to pre-school education for 3-5-years-olds, targeted family support and health services for families with younger children, and aims at broadly defined developmental goals (through a whole child approach), including emergent school skills. Sure Start is community-based and implemented in areas of greatest needs throughout the country. All families and children living in these areas are eligible for support and pre-school services upon demand, thus avoiding stigmatization. Several support strategies are combined, such as prenatal home visitation, postnatal health education, quick referral to specialized services, social meeting groups for parents, child-focused playgroups and pre-schools. Sure Start is highly decentralized, not prescribing one model or approach, but stimulating 'bottom up' initiatives. The Dutch VVE-policy is also intended to create permanent provisions of compensatory education programs for 2½-6-years-olds from disadvantaged background by promoting cooperation between day-care centers, playgroups, pre-schools, home-based programs and the kindergarten-departments of elementary schools in order to provide a continuous educational trajectory that extends into elementary school. Both initiatives share a strong focus on high-quality pre-primary programs offered as part of a comprehensive, coordinated approach to child development for high-risk populations.

Source: Leseman, 2002

4) Change the funding model and strengthen role of central government in key ECEC decision-making

- Problem – A funding model that relies on municipalities to cover 99 percent of the costs of ECEC is ineffective in a country with significant regional variation in fiscal capacity. Decisions currently made at the town and municipality level (e.g., opening of new kindergartens, terms and conditions for ECEC enrollment and co-financing) lead to inefficiencies and inequities due to lack of strategy and coordination.
- Approach – Revise the funding model to include targeted support to poorer regions. Evaluate which ECEC-related decisions could be better made at the national and regional levels and take steps to implement those changes. Develop and implement evidence-based long-term strategic planning – coordinated between central government, counties and local administrative units.
- Required action – Create the fiscal space at the national level to provide recurrent financial support to the most fiscally strapped municipalities. Candidates for reassignment of responsibility include decisions on new infrastructure, enrollment and co-financing criteria (e.g., equity-based prioritization of access, minimum allocation of local budget to ECEC, standardization of salaries (to address big disparities among and within towns and municipalities, to raise the status of the profession and to increase interest for working in less developed parts of the

country) and continuous investment in professional development for teachers and support professionals. Define an effective method to analyze local level data which is important for decision at higher levels of government.

- Risk management – Resistance from local levels of government to give up decision-making ability. In exchange for this, government would provide additional funding for towns and municipalities that have the greatest need for it (e.g., co-funding is already more common in primary and secondary education in Croatia than in ECEC – a move towards reallocation of funding will be required to expand access). Ensure that local information and knowledge is used by central government to make decisions with the bigger, national picture in mind.

5) Establish a quality assurance system in ECEC and beyond

- Problem: Quality assurance in ECEC and other education levels is not established
- Approach: Develop and implement a comprehensive quality assurance system in education, including ECEC
- Required action: Carefully design and start implementation of a quality assurance system to raise the quality of outcomes and of the management of the education system. Establish and ensure mechanisms for common planning, coordination and monitoring of education policy measures. Invest in the functional transformation and capacity building of national agencies. Enhance the system of self-evaluation and external evaluation of education institutions. Expand the external evaluation of learning outcomes and establish a digital system for evaluating and monitoring the achievement of learning outcomes.
- Risk management: Resistance from different actors at the local and national level, lack of funds, lack of sustained political commitment. Invest in designing a system that is fair and effective, with clear consequences for those who do not meet requirements and incentives to promote action take-up. Communicate expectations transparently and widely and establish an adequate period for the required adjustments.

4.2.1.2 VET, Adult Education and Lifelong Learning

1) Ensure coordination and key decision-making in VET and adult education are done at the national level

- Problem – Important decisions about course offerings, prioritization of schools and sectors, evaluation and certification of programs, optimization of the quota system, among others, lack a strategic approach and sometimes are over-influenced by local groups, and have consequences on the efficiency and effectiveness of the entire VET and adult education sector.
- Approach – Designate an institution, such as ASOO or an independent committee with technical competence, commitment to making VET more labor market relevant and the required authority at the national level to de-facto coordinate specific aspects of the VET and adult education system.
- Required action – Identify key decisions and processes that would benefit the most from coordination at the national level. Identify the entity best positioned to provide this role. Make any legal adjustments required for implementation of this arrangement. Define collaboration method with local governments. Use evidence available and secure additional data when needed through implementation of skills anticipation studies, tracer studies, etc. Adjust all local

placement quotas according to labor market needs and taking into consideration the demographic decline (so less prestigious courses are not penalized by a smaller cohort of students).

- Risk management – Lack of political capital to implement reform and confront eventual resistance from local levels of government. Funding issues between the central and local governments. Emphasize the win-win situation and design adjustment support for those negatively affected by reforms (e.g., teachers of courses to be discontinued). Ensure that local information and knowledge is used by the central government to make decisions with the bigger, national picture in mind. Central government to use conditionality for the transfer of funds if required.

2) Reform VET programs to better respond to the needs of the labor market and improve overall student learning outcomes

- Problem – Important mismatches involving the current skills set of the Croatian population and skills being developed by VET courses and the requirements of employers, both current and expected, exist in Croatia; VET students perform below general education students in international learning assessments; basic skills in math and language, reasoning, problem-solving and non-cognitive skills are in high demand but often lacking in graduates; VET courses are often outdated and are characterized by inadequate curricula designed and delivered without the input of the productive sector, teachers who are disengaged from trends and practices of their vocational field and/or do not have adequate pedagogical training, and the use of outdated equipment and materials; low levels of participation of employers in strategic decisions about VET and in day-to-day requirements of a labor market-focused system (e.g., hosting WBL opportunities, engaging in school boards, etc.); a series of laudable initiatives to improve the quality of VET offerings already exist, such as Sector Skills Councils and Sector Profiles, but their implementation is incomplete.
- Approach – Strengthen implementation of VET reform emphasizing curricula modernization, placing greater – not smaller – emphasis on transferable, basic competences in languages, Math, critical thinking, leadership skills, etc., optimize and expand Sector Skills Councils and Sector Profiles, relationship with employers, increased opportunities for WBL, effective design and implementation of centers of competence, capacity building of school officials, among others.
- Required action – Revise curricula based on current occupational qualifications, with special attention to basic skills in high demand by the labor market and for future learning. Train teachers on new curricula and to address other gaps in technical and pedagogical competencies. Improve quality of outcomes of Sector Skill Councils and expand structure to other relevant sectors. Design strategies to better engage and serve employers in VET (and adult education), including additional incentives and schemes to customize training to immediate employer needs (co-funded by the public and private sectors). Provide close supervision and support to centers of competence to ensure excellence and relevance of offerings. Identify main gaps in competencies of local VET personnel (principals, support staff, etc.). Launch campaign to improve image of VET in parallel to quality improvement measures.
- Risk management – Reform continues at current rate or stalls. New occupational standards and qualification standards do not lead to revised curricula, without effect on students. Employers remain uninterested in contributing to VET. Teacher training is disconnected from needs of the market and/or does not lead to improvements in the classroom. Centers of competence do not meet expectations, quality varies substantially from center to center. Mitigation could include concerted effort to secure political prioritization of reform. Emphasis on continuity of actions

with a focus on better student outcomes and higher employability. Design programs that are of interest to employers, including SMEs (e.g., customized training targeting specific business needs adapted and delivered to employer's' workers). Link training to other reform efforts, including on timing of training and materials. Follow training with support for implementation of lessons learned, create communities of practice for professionals to exchange experiences. Greater national support to the implementation of centers of excellence with establishment of rigorous minimum requirements for operations.

3) Develop a plan of action to address challenges and opportunities of 3-year programs

- Problem - Dwindling interest for this track of VET; limited WBL opportunities; outdated curricula, teachers disconnected from needs and practices of the labor market; cumbersome vertical integration with higher education; low prestige of courses.
- Approach - Instead of dealing with isolated challenges of 3-year VET courses, invest in developing a strategic plan at the national level before implementing changes, taking into consideration the current and upcoming market for these skills (a shortage exist for several occupations), effects of population decline, an analysis of the feasibility of making certain structural changes to 3-year programs (gradual specialization, greater vertical integration, etc.) with potential impact on the broader VET system as well as specific measures to stimulate student interest in shortage occupations (e.g., scholarships or stipends for students).
- Required action - Carry out studies to analyze the national and regional context for these programs and given the fungibility of funds, the opportunity cost of investing in them (instead of in areas of greater return on investments, such as ECEC). Consider multiple options, such as a revision to current programs to strengthen them (including elimination of certain programs in certain regions), a complete reform of the track, delayed vocationalization, etc. Make sure to include on the analysis measures with the potential to affect and improve other segments of the VET and general education system as well, such as tracking students at a later point in time to increase general skills in high demand by the majority of employers and higher education programs. Identify strengths and weaknesses of 3-year VET programs, regional needs and capabilities, and run pilots of new approaches when needed. Design a plan to improve the quality and relevance of 3-year programs, with special attention to the support that might be needed by students who typically follow this path, often the most vulnerable ones. Benchmark other EU countries that have been able to revamp their industry and crafts programs and make it more attractive to students and families.
- Risk management - Haphazard implementation of isolated actions. Resistance from schools and local government units to deal with problems on a direct, timely fashion due to expected losses to some groups of professionals. Mitigation efforts could include defining this reform as a priority at the national level and using national coordination to overcome private interests and provide remediation to potential negative effects of reform (loss of employment in certain sectors).

Box 4: Finland's efforts to improve quality and attractiveness of VET tracks

While a general, long-lasting perception that vocational education is reserved for "inferior" groups that would settle for low-paying blue-collar jobs exist in various countries, the low status of these programs is often linked with quality concerns. Many people associate vocational track programs with low academic performance, poor quality provision and blocked future pathways. And their concerns are often justified: often the least popular vocational tracks do not lead to higher education, their teachers are not properly qualified and up-to-speed on industry developments, and learning environments are precarious. Finland's way of addressing bias against vocational education has included a combination of policies to make VET tracks more attractive to students and families, including through thorough reforms to its vocational education system and sustained campaigns to change social perceptions. Making VET programs more competitive was part of the Finish strategy (nowadays, it is often more competitive than the general education track). Legislative reforms since the 2000s allow all VET students to progress to university or applied science levels and all students follow the national core curriculum required to access higher education. Finland increased funding to VET schools so they could pay teachers more competitive salaries, upgrade their learning environments and invest in professional development. Companies and other key stakeholders are constantly encouraged to participate in VET planning and processes. VET benefits are amply publicized to parents through publicity campaigns and VET schools across the country promote their services to parents by arranging regular visits and parents' evenings and showcasing students' achievements.

Source: Subrahmanyam, 2014

4) Create opportunities and conditions for increased participation of target groups in lifelong learning

- Problem – While Croatia ranks near the bottom of EU countries in indicator showing the level of participation of its population in lifelong learning activities, the situation is more acute for certain groups of people: citizens with lower levels of education and skills, youth and the chronically unemployed, who have the potential for the greatest gains from additional learning opportunities, and whose stagnant levels of skills contribute to low labor force participation, and low job productivity, among others; a series of barriers exist and are known, including financial costs, opportunity costs, limited availability of courses, lack of interest, etc.
- Approach – Strengthen the implementation of priority actions highlighted in the country's framework for lifelong learning; design an action plan and implementation strategy to address some of the key barriers identified to increase participation in lifelong learning activities, especially for those most disadvantaged; move forward with preparations to participate in the next round of the Survey of Adult Skills (PIAAC) to better understand the competencies of the Croatian adult population and inform future policies in this area.
- Required action – Improve the quality and relevance of adult education courses, including Continuous VET (CVET) to ensure participation by target group lead to individual and societal benefits. Increase funding for programs targeting key employed and unemployed populations and occupations with shortage of skills. Ensure the country has the competencies needed to administer PIAAC; in the meantime, use results from existing studies (AES, CVTS) to identify and address barriers.
- Risk management - Despite lowering of barriers, uptake of learning opportunities remains low. Not enough funds set aside for priority groups, same pattern of participation remains (more skilled takes significantly greater advantage of opportunities). Low participation is likely to have multiple causes, including cultural roots, which takes longer to shift – plan for remedial

measures in the short, medium and long term. Clearly prioritize and communicate focus on target populations but an overall increase would also be desirable and should be expected.

4.2.1.3 Higher Education and Science

1) Improve the HE quality assurance system

- Problem – There are no structural links between CROQF's qualification and occupation standards on one side and the initial accreditation of study programs and the reaccreditation of HE institutions on the other side.
- Approach – Connect CROQF and the national quality assurance system by aligning learning outcomes and ECTS contained in the study programs with those contained in the corresponding qualification standard from the CROQF Register.
- Required action – Develop a new concept for initial accreditation of study programs using CROQF. Develop a new concept for reaccreditation of HE institutions that combines institutional evaluation with the evaluation of study programs using CROQF. Develop a new concept for the implementation of the recognition of prior learning in HE.
- Risk management – Resistance to link CROQF and quality assurance system because of current insufficient numbers of qualification standards in the CROQF Register. Mitigate by comprehensive training of key stakeholders on the benefits of the CROQF.

2) Improve legal framework for HE

- Problem – The current legal framework for HE is incoherent and fraught with inconsistency and contradictions. Among key problems is a rigid system of hiring and promotion, a financing system that is not performance-based and is not transparent, the fact that each faculty within non-integrated universities has legal autonomy.
- Approach – Create a new Act on Scientific Activity and HE and Act on QA in HE as the centerpiece of HE legal framework. Secure foundation for the functional integration of non-integrated universities
- Required action – Conduct requirements and expected impacts analysis for a new act. Organize wide consultations involving all stakeholders. Create a new act and related bylaws. Secure consistency with other acts.
- Risk management – Provisions on the university autonomy in the Constitution may impede creation of a new act that attempts modernization of the HE system. Secure wider public and political support for the new act.

3) Improve managerial and leadership capacity of middle and top management in HE institutions

- Problem – Currently there is no systematic policy initiative aiming at training and delivering structured support for developing managerial and leadership capacity in middle and top management at HE institutions.
- Approach – Select an existing entity to be responsible for improvement of managerial and leadership capacity of middle and top management at HE institutions.

- Required action – Implement continuous education program for developing managerial and leadership skills in HE. Create support networks of middle and top managers at HE institutions. Create a network of experts available to provide tailored advice and technical support. Modify the legal framework to introduce, among other, better governing mechanisms of HE institutions instead of the bottom-up system in place today, establish clearer roles for HE leaders, set term limits, and allow the possibility of brining new leaders from outside institutions.
- Risk management – Resistance of top management towards committing resources for such professional development can be mitigated by making this mandatory and part of HE institutions' evaluation criteria.

4) Improve attainment in higher education

- Problem – Decreasing attainment rates and stagnation in HE enrollment due to the fact that students do not complete their studies or take longer than expected to do so. These very low attainment rates exist in a context where the country needs to increase attainment rate in line with EU goals and "produce" more high skilled workers.
- Approach – Introduce policies for enhancing quality teaching and learning in higher education.
- Required action – Develop monitoring and evaluating system with quantitative targets on drop-out and completion rates, create overarching policy approach at improving quality of teaching and learning at higher education institutions, develop a new concept for evaluation of teaching in academic staff career, implement specific academic staff education program for enhancement of teaching skills in HE, introduce incentives for development of quality teaching and learning in higher education institutions.
- Risk management – Resistance within academic circles to adopt new approach and teaching methods. Mitigate by comprehensive awareness raising campaign on the benefits of quality teaching and learning.

5) Improve the quality of support programs for research and innovation

- Problem – Lack of targeted approach to design instruments throughout the innovation chain – from basic research to commercialization, improper incentives in place or lack of incentives, burdensome procedures of implementation and long process of application approval.
- Approach – Reconsider the design, implementation, and evaluation mechanisms in place for support programs, with the objective of improving the country's research and innovation performance, something MSE and other stakeholders have already initiated.
- Required actions – Conduct systematic review of all public support to research and innovation. This entails:
    - Analyzing the quality and coherence of the policy mix by taking stock of all support instruments, assessing the allocations, overlaps, gaps, redundancies, diversification, etc., and assessing the link between the demand and the supply of support programs;
    - Conducting an in-depth assessment of the design, implementation and governance of support programs;
    - Monitoring and evaluation of programs by developing a framework to track and analyze inputs, activities, outputs and outcomes.

- Risks management – There is a tendency of strong reliance on EU financing for support of research and innovation, even though not all research and innovation projects and programs are necessarily compatible with this source of finance. To mitigate this, national programs should fill in the observed gaps.

6) Improve working conditions in order to retain human resources in RDI and attract foreign researchers, stimulating and supporting researchers

- Problem – Inadequate conditions for research excellence, ability to attract, develop and retain domestic and international human resources.
- Approach
  - Building capacities of research organizations to conduct internationally comparable research and engagement in European and international research projects;
  - Integration of Croatian researchers into European research area by investing in development of human resources.
- Required actions – Improve conditions for conducting top-level scientific research through the development of strategic RDI infrastructure and human resources in the RDI sector.
  - Invest into strategic research infrastructure, which creates and supports excellent science by providing scientific community state-of-the-art resources and responds to the demand for knowledge transfer and innovation from societal and business actors. Through providing financial support for infrastructural investments it is expected that the scope, size, quality, attractiveness and international competitiveness of research and development activities, as well as administrative and absorption capacities of scientific organizations, will increase;
  - Encourage investments into cutting-edge research performed by top-level scientific research groups that raise the level of quality of the Croatian R&D sector. The groups have to be internationally competitive and recognizable in terms of quality and scope of scientific production, capable of effective international cooperation and be able to make significant contributions to the development of science, HE and the economy at the national level;
  - Provide additional financial resources for projects with identified and established development potential, such as through additional financial support to the projects that have secured funding through centralized EU programs or achieved high results in applying for them (whether they received funding or not). This will increase the research capacities and competitiveness of scientific organizations in attracting investment to research projects. The quality and availability of services/research provided by scientific organizations will be strengthened, which will contribute to a more successful integration into the European Research Area (ERA) and the international research community;
  - Introduce necessary conditions for career development of young researchers in the field of research, development and innovation at doctoral and post-doctoral levels. Additional opportunities for their employment needs to be supported through involvement in research teams and projects in Croatia, cooperation and participation in European and international projects, and increases in the number of PhD and postdoc students in the private sector.

- Develop appropriate instruments to increase the number of young researchers especially in STEM fields. All activities under this mechanism should be geared towards the development of a more favorable scientific and research environment to increase the influx of quality scientific staff, reduce the outflow of young and experienced researchers and increase the competitiveness of Croatian scientific organizations and private sector.

- Risks management – To manage risks associated with this activity, ensure the timely and adequate preparation of technical documentation and issuing building permits for strategic infrastructural projects; develop national rule/guidelines on open access and use of infrastructure by the scientific community; promote the creation of research groups that perform cutting edge research; provide easy access to international research (foreign databases and online journals); take measures to continuously address the brain drain in Croatia.

7) Enhance collaboration between science and industry through fostering technology transfer and research commercialization

- Problem – Insufficient commercialization of research results and insufficient research orientation towards the needs of the economy, low level of R&D collaboration between research organizations and business sector, lack of high-quality innovation services.
- Approach – Create an environment and introduce proper schemes that enable and encourage interaction and transfer mechanisms leading to a collaborative research community. Introduce a dynamic policy approach with vertical identification of problems and goals, while simultaneously implementing a bottom-up approach in which solutions are reached by engaging multiple sectors, actors and academic disciplines. An open and synergistic research and innovation process that encourages experimentation in search of new and multiple, yet realistic solutions, means that some of them will fail and need to be adjusted which will in turn strengthen the RDI process as a whole.

  Required actions –

  - Assist potential beneficiaries in drafting project proposals for ESIF and HORIZON competitions and consult beneficiaries of ESIF-funded projects in implementing public procurement procedures;
  - Provide support for projects conducted by research organizations to facilitate market-oriented RDI activities and dissemination of results to the business sector;
  - Provide support for projects conducted by research organizations in collaboration with the business sector to develop research activities in line with the needs of the economy.
  - Provide support for proof-of-concept activities as a key step in market-oriented research that stimulates science and industry collaboration and commercialization.
  - Provide “soft” support to encourage the development of dedicated technology transfer organizations. Such organizations should have staff skilled in managing IP and promote spin-off companies, with the outcome focused on successful TT cases.
  - Promote the establishment of long-term consortia between the public sector (research providers) and the private sector (research users) to ensure financial sustainability and the long-term alignment between research output and the needs of the economy.

  Risks management –

- Lack of interest from the private sector for the proposals for research can be mitigated by better outreach towards the business sector;
- Create unified national rules for EU funds for all sectors of investments;
- Ensure that procedures for application, evaluation and implementation for smaller scale innovation projects (PoC) are simple and streamlined;
- The risk of unfinished reforms of public research institutes and universities can be mitigated by securing wider public and political support for the completion of reforms.

8) Improve access to finance for HE and RDI

- Problem – Resources are limited and distributed inefficiently; links between performance and financing are suboptimal, limited eligibility of type of costs within Horizon Europe.
- Approach – More funds from national sources (linked to performance); improving access to ESF and H2020 funds, promoting reforms at HE institutions and PROs which will improve their governance, performance and internationalization.
- Required action – More funds for performance-based contracts and competitive research; simplifying administrative procedures and selection criteria; governance reform as envisaged by the Strategy for Education, Science and Technology; support to internationalization.
- Risk management – Institutional inertia, interest groups; competition for budget resources. Mitigation could include policy dialogue, stakeholder involvement, incentives. Uncoordinated procedures between Horizon Europe and OP 2021-2027 should be addressed and adjusted.

4.2.2 Medium-term (4-7 years)

4.2.2.1 Early Childhood Education and Care

1) Establish the legal right to ECEC for all children and secure additional infrastructure and workforce to enroll an higher percentage of children up to 3 years of age, beyond the EU2020 goal of 33 percent

- Problem – Demand for ECEC for children of all ages is greater than what can be accommodated in the short run. Participation of children under 3 is particularly low at 21 percent in 2017/2018.[124]
- Approach – Secure appropriate infrastructure – new or existing – to offer new openings. Train and recruit new teachers and support professionals to meet demand.
- Required action – Change legislation to include a right to ECEC (government provision when demanded). Use evidence to determine areas of greater need and demand for infrastructure and ECEC workforce. Learn from efforts to expand access in the short term
- Risk management – Resistance against establishing a rights approach in this area. Not planning, in the early stages of the expansion of the system, for increased demand in the medium and long run while might lead to missed opportunities (e.g., incorrect sizing of a new kindergarten building that doesn't take into consideration increased demand later on). Mitigation efforts to include understanding of how other EU countries that guarantee ECEC to all children have

[124] Croatian Bureau of Statistics, accessed on Sept. 2018

increased their capacity to accommodate a larger number of children. Include medium and long-term forecasts for ECEC in current planning and take them into consideration when making decisions.

Box 5: Universal pre-primary education and the right to ECEC in Europe

Access to ECEC is increasing in all countries at least in part because of public spending to extend legal entitlements to a place in ECEC as well as governments' efforts to ensure free access, at least for some ages and population groups.[125] Throughout Europe, the concept of universal access is generally accepted for children between the age of three and compulsory school age. According to the OECD, most European countries offer at least one year of free, publicly funded early childhood care to all children before the start of primary school. Several countries established legal entitlements to ECEC in the late 1980s and 1990s. In Belgium, France, Italy and the Netherlands, for example, national legislation entitles access to free pre-school services from the age of 30 months, 36 months and four years, respectively.[126] There is significant variation in the coverage of legal entitlements, with Norway and Germany securing a place in ECEC for ages 1 through 5, while in Portugal and the Czech Republic the guarantee covers only the last year before children enter primary education.[127] Similarly, the number of hours per week covered by legal entitlements varies significantly. For example, in Norway the guarantee is of 41 hours of ECEC per week, while in France it's 24 hours and in Austria it's between 16 and 20 hours for the year before primary school.

2) Strengthen quality assurance processes in ECEC

- Problem – Room for improvement exists in various fronts, such as implementation of the curriculum reform, program assessment, support for vulnerable families.
- Approach – Implement a series of quality improvement measures, including but not limited to implementation of the new national framework curriculum, development and implementation of quality assurance processes on the institutional level, better support services to disadvantaged families, such as language support, specialist visits, etc., implementation of licensing and relicensing of ECEC professionals to increase quality of teaching and administration.
- Required action – Promote quality within ECEC institutions by focusing on professional development of teachers and other ECEC professionals, building supportive learning environments and developing strong partnerships with families and local communities. Make self-assessments compulsory and develop other quality assurance mechanisms, providing support to kindergartens in areas of deficiencies. Expand support services to minority and other disadvantaged families with young children to meet their specific needs. Move forward with plans to establish a licensing/relicensing mechanism for teachers and kindergarten principals
- Risk management – Lack of agreement on the new curriculum framework implementation or inadequate training of teachers. Kindergartens' lack of awareness for the need to implement self-evaluation processes. Resistance about licensing policies from local and national governments and communities, including from preschool teacher unions. Mitigation efforts could include securing funds for continuous training of teachers and other important components of the framework. Provision of additional support to kindergartens to implement self-assessment and make some elements of the quality assurance system mandatory. Coupling self-assessments

[125] OECD, 2017
[126] Neuman, 2005 - Governance of Early Childhood Education and Care: Recent Developments in OECD Countries, as cited in Urban, 2009
[127] OECD, 2017

with visits from a central team of specialists to identify areas for improvement that might not have been raised by kindergartens. Championing the issue as a matter of improved quality and efficiency of ECEC to benefit local children to gain broader support for licensing, addressing local concerns when viable

4.2.2.2 VET, Adult Education and Lifelong Learning

1) Implement comprehensive changes to 3-year programs

- Problem – Dwindling interest for this track of VET; limited WBL opportunities; outdated curricula, teachers disconnected from needs and practices of the labor market; over-specialization and cumbersome vertical integration with higher education; low prestige of courses.
- Approach – Based on a detailed action plan to be developed in the next 1-3 years (see short-term policy recommendations), make 3-year programs compatible with new and upcoming employment trends (likely fewer jobs involving routine manual tasks, but shortage of skills in others) and demographic changes, adjusting quotas and making programs leaner and significantly increasing their quality.
- Required action – Carefully implement actions defined in a strategic document analyzing the supply and demand for these programs as well as their strengths and weaknesses. Implement a small package of measures aimed at providing adjustment assistance (e.g., re-training, etc.) to teachers and other professionals engaged in programs to be discontinued or transformed.
- Risk management – Haphazard implementation of isolated actions. Resistance from schools and local government units to deal with problems in a direct, timely fashion due to expected losses to some groups of professionals. Define VET reform as a priority at the national level and use national coordination to overcome private interests and provide remediation to potential negative effects of reform (loss of employment in certain sectors).

2) Implement a quality assurance system to improve learning and employment outcomes of adult education

- Problem – Simply increasing participation in lifelong learning opportunities, including adult education, without a similar focus on quality of offerings would not lead to meaningful individual and societal gains. A disconnect from labor market needs and an excessive number of providers who offer courses of unknown quality that are subject to limited government oversight are some of the main areas of concern in adult education.
- Approach – Similarly to VET, adult education courses, including CVET, should be closely connected to labor market requirements and be of high quality to ensure desirable learning outcomes; invest in quality improvements through greater monitoring and evaluation of providers and programs based on a quality assurance system.
- Required action – Design and implement a quality assurance mechanism based on self- and external evaluations, tracer studies and more stringent certification procedures for providers of adult education, with binding consequences for providers that do not meet minimum requirements; create an integrated register of providers to increase transparency and to allow for better monitoring/tracking of outcomes; consider using a star system to communicate different levels of compliance with standards to users.

- Risk management – Lack of financial and human resources to design, implement and continuously improve new quality assurance and certification system. Resistance from providers that benefit from the existing lack of transparency. Mitigation measures could include careful planning and estimation of resources and support needed for implementation; strong communication campaign to stimulate demand for quality. Place quality of education above potential pressures from interest groups, communicate well about this strategy.

4.2.2.3 Higher Education and Science

1) Improve graduate employability

- Problem – Curriculum design and HE admissions quota are not informed by the labor market and societal needs.
- Approach – Introduce policies for enhancing graduate employability. Match admissions quotas to labor market and societal needs and consider using funding to encourage and channel demand to areas with the greatest need from the labor market.
- Required action – Monitor graduates' transition into the labor market through a graduate tracking system. Introduce labor market needs forecasting. Include practical training and work placements in HE study programs. Improve career guidance services at HE institutions.
- Risk management – HE institutions are resistant to using a graduate tracking system and forecasting in admissions and curriculum planning, and to including work placements in study programs. Mitigate by making actions mandatory through regulations or funding agreements.

Box 6: Use of employability data to inform education policies and funding

Administrative data about graduates' employability in the Czech Republic is collected regularly from labor offices and used as one of the indicators for the decision on the performance-based component of funding of HE institutions. In Finland, administrative data on graduates' employment is used for national forecast planning of education, setting targets for the number of degrees in different fields of study and defining institutional performance agreements. The indicator on employability of students forms a fixed percentage of the performance-based funding allocation in the Czech Republic, Estonia and Slovenia.[128]

2) Introduce a three-pillar model for state funding of HE institutions: (1) basic funding, (2) performance-oriented funding, (3) innovation-oriented funding[129]

- Problem – The structure of state funding for HE institutions is fragmented: it does not combine funding (1) for alignment with labor market, (2) for HE and research together, and (3) for development and strategic specialization. There is no systematic monitoring and evaluation of funding policies.
- Approach – Introduce a three-pillar model: (1) basic funding based on the number of study places and number of employees; (2) performance-oriented funding using a formula including performance indicators like number of graduates, number of PhDs, etc.; (3) innovation-oriented funding using funding agreements for achieving targets which refer to teaching, research

[128] ECEE, 2018:238-239
[129] Arnhold et al., 2018

and third mission activities (outreach, community engagement, local and regional development, lifelong learning, etc.).

- Required action – Explore strategic basis and define components and indicators of performance-oriented (paid ex post) and innovation-oriented funding (paid ex ante). Use peer counseling to promote the exchange of best practices used in the EU for state funding of HE. Develop regulations needed for the implementation. Establish monitoring and evaluation systems (evaluate previous funding agreements).
- Risk management – Difficulties in changing the legal framework needed for the implementation, particularly in terms of solving the problem of non-integrated universities. Mitigate through extensive public consultations on this topic. Secure wider political support.

Box 7: Latvia's experience improving HE funding, governance and academic careers

Since 2013 Latvia has made significant progress in improving the financing and governance of

HE. That year the Latvian government was tasked by the European Commission, in the framework of the European Semester's Country Specific Recommendations, with evaluating its HE financing system and considering how funding could be used to promote better outcomes. The Latvian Ministry of Education and Science engaged with the World Bank to create a new higher education financing model through two advisory projects. The first project, implemented in 2013-2014, focused on the development of a performance-based, system-level funding model for the higher education sector. In 2015 the new financing model was approved by the government, successfully incorporated in legislation and its introduction accompanied by a much-welcomed increase in funding for the HE sector. The policy recommendation on the introduction of a three-pillar model for state funding of HE in Croatia is based on Latvia's positive experience in this area.

The second project, divided in two phases, focused on improving funding mechanisms and governance within higher education institutions and on improving academic careers. Together, these initiatives comprehensively supported performance improvements from the system level to individual academic careers. The success of these initiatives is rooted in the consultations and consensus building that was possible thanks to the substantial engagement of leading Latvian HE institutions and core stakeholders.[130]

3) Improve student support from the state

- Problem – Low share of students who receive scholarships. Average scholarship amount is too low in comparison with average student expenses. No evidence of how state student support system impacts disadvantaged students. Lack of data on the impact of high-skilled emigration on HE policies.
- Approach – Improve student support from the state by providing direct support through scholarships based on demonstrated need and increase scholarship amount to actual cost of study. Support should include part-time students and be directed to identified disadvantaged student groups.
- Required action – Increase the number and amount of the state scholarships support ; goal: cover >20% of students. Take the impact of high-skilled emigration on HE policies into account when designing student support. Phase out indirect support (meal subsidies) and redirect the funding into support through direct scholarships.

[130] World Bank, 2018g

- Risk management – Insufficient funding from public sources; resistance to phasing out indirect support; resistance to change tax regulations. Consider using European Social Fund in addition to the state budget to finance scholarships.

4) Institutional capacity: policy evaluation, implementation, and monitoring

- Problem – Uninspiring innovation performance, despite significant EU funds dedicated to advance the research and innovation agenda, partly due to suboptimal capacity to manage innovation policy and public spending in R&D.
- Approach – Strengthen the institutional capacity for planning and implementation of R&D&I.
- Required actions – Create a specialized agency with the core focus of supporting the innovation environment in Croatia. Build the capacity to manage research and innovation policy with a focus on design, implementation, monitoring and evaluation.
- Risks management – lack of long-term perspective and consistency over time can be mitigated by better planning, monitoring and evaluation.

5) Improve efficiency of public research organizations in performing excellent research

- Problem – Inefficient organizational structure of public research organizations and low level of international competitiveness.
- Approach – promote reforms to improve governance, performance and internationalization of research organizations.
- Required actions – Review legal status of public research organizations. Introduce performance-based budgeting. Increase the autonomy and accountability of directors (management). Introduce tenure track for researchers and enable higher levels of flexibility for staff compensation; Enable the creation of Research and Technology Organizations.
- Risks management – Political constraints to review the legal framework, which can be mitigated during elaboration and public consultations on the new Act on Scientific Activity and HE and subsequent regulations.

4.2.3 Long-term (8-10 years)

4.2.3.1 Early Childhood Education and Care

1) Make ECEC free for all children through a phased approach

- Problem – As a key component of lifelong learning with significant impact on children's lives and societal benefits, universal free access to ECEC would strengthen Croatia's human development. This policy would follow on the footsteps of free primary and secondary education for all.
- Approach – A phased approach to standardize and reduce costs of ECEC to families can be adopted until ECEC is universal and free to all. Priority in the exemption of fees phased approach (targeting) should be given to children from disadvantaged backgrounds who can benefit from it the most. Older children (4-6) should also be given priority.

- Required action – Co-financing from local and national government will be needed to make ECEC eventually free for families – careful planning to find the fiscal space for this is required and should be done once most capital investments in ECEC are done. Criteria for the phased approach should be standardized at the national level.
- Risk management – Free ECEC in a phased approach not affordable in this timeframe (starting in 8-10 years). Policy makers do not see the need to make it free. Plan in advance to secure appropriate resources and rearrange budget priorities. Learn more about the experiences of other countries that have implemented free ECEC. Same arguments for making basic education free for all are valid for ECEC.

4.2.3.2 VET, Adult Education and Lifelong Learning

1) Complete VET reform to encompass all sectors and courses

- Problem – Important mismatches in the demand and supply of skills currently undermine the effectiveness of the VET system. Previous actions to bring together employers and VET professionals and to upgrade the overall quality of VET offerings should have made the VET system more effective by now, but challenges are likely to remain, with a comprehensive reform requiring continuity of policies and efforts.
- Approach – Address mismatches in remaining sectors by expanding successful practices to all areas of the economy; update courses and teachers' competencies; further expand opportunities for WBL; strengthen the image of VET tracks; ensure process to recognize prior learning in adult education and VET is well-established and effective.
- Required action – Coordinate actions at the national level based on needs of the economy and remaining gaps in VET provision. Strengthen relationships with the productive sector to maintain VET offerings up-to-date and relevant and correct course when necessary.
- Risk management – Reform did not advance as expected in previous years. Discontinuity of policies and actions due to changes in the political context. Mitigation measures could include champion efforts to secure continuous top-level commitment to revitalizing the VET sector and invest on creating a national "pact" to make the changes needed for better learning and employability outcomes.

4.2.3.3 Higher Education and Science

1) Use CROQF to improve HE qualifications and curriculum

- Problem – Curriculum design not based on qualification and occupation standards. Structural reform tools not properly implemented in curriculum: learning outcomes, ECTS, degree structure.
- Approach – Improve relevance and quality of qualifications and curriculum by using the existing CROQF.
- Required action – Develop occupation and qualification standards and enter them into the CROQF Register. Develop curriculum based on qualification and occupation standards.
- Risk management – Lack of resources, political commitment, and ownership from key stakeholders. Mitigate through comprehensive training of key stakeholders and by an awareness/promotional campaign about CROQF.

2) Enhance equity to increase HE attainment rate

- Problem – Current activities trying to address the low attainment rate are not sufficiently oriented towards enhancing oequity, and not informed by an analysis of the impact of high-skilled emigration on both equity and HE attainment. Systematic monitoring and evaluating is not implemented.
- Approach – Integrate all HE attainment and equity-related policy instruments into a coherent *National Plan for the Social Dimension in HE*. Focus policy actions on identified categories of disadvantaged learners listed in the Plan.
- Required action – Collect data and analyze the impact of high-skilled emigration on equity and HE attainment. Integrate in the Plan policies on: widening access, improving retention and completion, graduate employability, funding, equity-sensitive quality assurance.
- Risk management – Resistance in implementing policy coordination across different organizational units and sectors. Mitigate through a cross-sectoral monitoring body and a transparent and efficient information system for monitoring and evaluation.

3) Develop a functional innovation system

- Problem – General absence of comprehensive approach to develop stable, coordinated and effective national innovation system.
- Approach – Develop policy instruments for continuous investing into the full research and innovation value chain, creating an environment that enables and encourages the collaboration of the research community with innovative business and social activities. Streamline future strategies. Seek synergies between bottom-up and top down approaches. Implement action and financial plans related to strategic documents. Conduct systematic monitoring and evaluation.
- Required action – Continuously fund all stages of the innovation process by acknowledging that research activities might fail to provide the envisaged results and could need to be adjusted which might lead to new directions of research and new/modified results. Improve policy learning basis on systematic monitoring and evaluation - policies should take into account the entire research and innovation value chain, from fundamental research to applied research and innovation. Ensure that further investments in system improvement are based on the monitoring/analysis of programs implemented in previous periods (public expenditure review already initiated). Reform public administration. Establish a business competitiveness program. Ensure knowledge sharing between projects and organizations. Introduce financial instruments for research activities resulting in all Technology Readiness Levels (TRL).
- Risk management – Institutional inertia/silo mentality, low competitiveness of the business sector, inadequate business climate. Mitigation could involve political support, improving competitiveness, policy dialogue, stakeholder involvement, and use of incentives.

5 Cross-cutting issues and their implications for policy

Education is central to the development of a nation and to its prosperity; therefore, improvements in education outcomes will affect almost all sectors. Children who attend high quality ECEC are more prepared for further education and less likely to require government spending in later years (remedial programs, incarceration fees, etc.). Access to high quality ECEC has the potential to mitigate socio-economic and other disparities while enabling parents to work. Children and youth who learn and develop solid basic skills have a stronger foundation for continued learning. VET programs closely connected to labor market requirements can lead to increased productivity and higher labor participation of graduates, with a marked impact on the economy. Adult and lifelong learning opportunities that are relevant and of high-quality help ensure workers and citizens remain prepared for a productive life. Higher education and Science with close links to the productive sector and high levels of efficiency help fuel innovation, economic growth and regional integration. Education's impact on the well-being of individuals and societies is incontestable. Smart investments in education can benefit all of Croatia.

Policies and programs at one education level have the potential to influence and impact other levels and increase their effect on the broader society. Examples include initiatives on equity and recognition of prior learning. While different actions to increase equity at the different levels of education are discussed in this note, a comprehensive national plan for the enhancement of equity in all educational levels has the potential to be more effective. Enhancing equity in pre-tertiary education supports the successful implementation of equity policies in HE, for example. The causes of vulnerability can be traced back to youth and continue through all education levels, increasingly hindering the prospects of students. Therefore, the National Plan for the Enhancement of Equity in HE could be extended to include other education levels into a comprehensive national plan aiming to strengthen equity in the entire education sector. The recognition of prior non-formal and informal learning (RPL) offers an opportunity for cooperation between different components of the education system. RPL is in its early stage of development in Croatia and ties in with the development of CROQF. It would have a positive impact on many education and broader domains, such as on widening access, progress and completion, equity, employability and mobility.

6 Proposed implementation roadmap

6.1 Early Childhood Education and Care

1) Secure required infrastructure to move towards universal access to Quality ECEC for 4-6-year old and access to at least 33 percent of children under 3

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Create a plan at the national level for strategic increase of ECEC infrastructure 2. Identify and secure financing 3. Implement plan starting with high priority areas	1: Plan created 2: Financing secured 3: Expansion capacity reached	EU funds, national funds, additional funds TBD	Infrastructure

2) Adopt key teacher policies to secure sufficient number and quality of teachers and supporting professionals and administrators

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Identify number and location of ECEC teachers and support professionals needed in the short and medium term 2. Adopt transitional measures to meet short-term needs (e.g., re-qualification of other educators, employment of in-training students)[131] 3. Build capacity of university training programs 4. Train, hire and deploy teachers	1: Teacher forecast prepared 2: Temporary staffing provisions adopted 3: Universities capable of accommodating increased number of students in ECEC programs 4: Adequate number of teachers trained, hired and deployed	National funds	Capacity building

3) Increase equity in access and quality of ECEC for disadvantaged children

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Identify underrepresented and disadvantaged groups and main barriers to their access 2. Create an action plan to address ECEC inequities nationally 3. Secure financing to implement action plan 4. Implement plan starting with high priority areas	1: Plan created 2: Financing secured 3: Measures taken to increase access of children from disadvantaged backgrounds and regions to ECEC	EU funds, national funds	Equity

[131] These measures will be necessary to avoid stalling of the expansion effort, while not compromising quality long-term

4) Change the funding model and strengthen role of central government in key ECEC decision-making

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Identify the fiscal space at the central level to absorb some ECEC costs currently being covered at the municipal level 2. Create a transfer program to financially support the poorest regions 3. Identify jurisdiction for key decisions 4. Identify most appropriate funding arrangement for expansion and sustainability of quality ECEC system	1: Funds allocated at the national level to support expansion of ECEC coverage 2: Transfer of funds to municipalities for ECEC institutionalized 3: New governance of system designed and approved	National funds, EU funds, additional funds TBD	Finance; Governance

5) Establish the legal right to ECEC for all children and secure additional infrastructure and workforce to enroll an increased percentage of children up to 3 years of age, beyond the EU2020 goal of 33 percent

Starting from	Sub-actions	Milestone	Resource(s)	Area
2023	1. Study financial, human and physical feasibility of proposal 2. Prepare a strategy to address increased demand for ECEC (infrastructure, teachers, etc.) 3. Pass legislation to create right to ECEC 4. Build capacity of local ECEC administrators to implement system, with a special focus on children up to 3 (main group likely to still be outside ECEC system) 5. Increased infrastructure and train/hire teaches starting with areas of greatest expected demand	1: Decision to establish right to ECEC made 2: Strategy to implement the change approved 3: Legislation passed 4: Officials and institutions ready to accommodate increased demand 5: Expanded infrastructure and adequate # of teachers in place	National funds; EU funds; additional funds TBD	Governance; Finance

6) Strengthen quality assurance processes in ECEC

Starting from	Sub-actions	Milestone	Resource(s)	Area
2022	1. Further identify key priority actions to improve the quality of the system 2. Secure funding for priority initiatives within the quality assurance system 3. Create implementation plan for priority actions, such as professional development of teachers, self-assessment, licensing and relicensing of ECEC teachers and professionals, and targeted support to disadvantaged/minority children and families	1: Priorities identified 2: Funding secured 3: Implementation plan developed 4. Actions implemented	National funds, EU funds	Quality, Capacity Building

	4. Start implementation			

7) Make ECEC free for all children through a phased approach

Starting from	Sub-actions	Milestone	Resource(s)	Area
2026-2028	1. Develop a feasibility plan to make ECEC free and available to all children using a phased approach starting in 8-10 years (prepare plan in the next 2 years, by 2020) 2. Create the fiscal space and secure the additional funding required to implement the policy over the years, according to the plan 3. Invest in the required infrastructure and human resources 4. Roll out phased approach (e.g., starting with disadvantaged children, then children 4-6, then younger children, etc.)	1: Feasibility plan made and approved by the appropriate authorities 2: Funding secured for the different phases of the expansion 3: Kindergartens built/expanded, teachers trained and mobilized, populations aware of new policies and its phased implementation 4: Young children enrolled	National funds; EU funds; additional funds TBD	Finance; Access; Infrastructure; Capacity Building

6.2 Primary and Secondary Education

1) Increase instruction time by raising the number of hours in the school day or making compulsory education longer, with required adjustments in curricula

Starting from	Sub-actions	Milestone	Resource(s)	Area
2020	1. Conduct a feasibility study and learn from international best practices 2. Change legislation 3. Reallocate funds 4. Develop curriculum for whole-day schools or an additional year of primary education 5. Teacher education 6. Pilot	1: Study conducted 2: Revised Act on education in primary school and derived acts adopted 3: Financial resources for structural change in education system on national and regional level secured 4: Curricula created 5: Teacher education program implemented (PD) 6: Pilot designed, implemented and evaluated	National funding; World Bank loan; European Structural and Investment Fund; Structural Reform Support Programme (SRSP) European Social Fund (ESF)	Quality

2) Optimize the school network to improve efficiency and allow for increased instruction time

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Produce a strategic document to guide the development and implementation of the reform	1: Study conducted 2: Stakeholders consulted and growing support for the initiative 3: Plan/strategy developed	World Bank funds; European Structural and Investment Fund; Structural Reform	Governance

	2. Engage with stakeholders and build support for changes 3. Develop a plan/strategy to guide optimization 4. Initiate changes and monitor results	4. Optimization measures taken	Support Programme (SRSP) European Social Fund (ESF)	

3) Address equity issues and strengthen support to struggling students to improve learning outcomes

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1: Expand/strengthen support instruction programs for struggling and at-risk students -ensure institutional arrangement (allocated time, funds and teachers to work with target students); whole school approach 2: Conduct teacher training and professional development 3: Collect and use data to better identify weaker students (standardized assessments) 4: Prioritize disadvantaged students in ECEC enrollment 5: Develop, test and implement comprehensive program for students underperforming	1: Support programs expanded and implemented across the country 2: Teachers trained 3: More data available on a national level about student performance 4: Improved enrollment for disadvantaged students in ECEC 5: Broader program to address academic difficulties piloted and scale up started	European Structural and Investment Fund; Structural Reform Support Programme (SRSP) European Social Fund (ESF)	Equity; Quality

4) Improve curricula and teaching practices by prioritizing implementation of the curricula reform

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Improve preparation of teachers to implement the reform 2. Secure adequate textbooks in accordance with new curricula 3. Evaluate the pilot (external evaluation) and make changes before scaling up 4. Develop and approve implementation plan for the reform (including lessons learned from pilot) 5. Ensure continued allocation of appropriate resources to implement reform 6. Scale up the reform 7. Emphasize continuous teacher preparation and introduce classroom observations	1: Teachers adequately prepared to lead changes 2: Adequate textbooks secured 3: Pilot evaluated and lessons learned publicly shared 4: Action plan prepared and approved 5: Adequate financial resources set aside for reform implementation 6: Reform scaled up 7: Continuous teacher development program strengthened with class room observation implemented	National funds, EU funds	Governance; Quality

5) Adopt teacher policies that support improved learning and greater efficiency

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Conduct a detailed analysis of teacher numbers, allocation, shortages, etc.	1: Teacher analysis conducted	National funds	Quality; Governance

	2. Act on most pressing issues unearthed by analysis 3. Make a concerted effort to attract STEM teachers 4. Strengthen professional development of teacher trainers at ASOO and AZOO 5. Adopt a national qualifications framework for the teaching profession 6. Reform key elements of the teaching profession that will make it more attractive to high caliber candidates 7. Pilot and evaluate a classroom observation program as part of teachers' professional development	2: Implemented of key changes started 3: Higher number of STEM teachers attracted and retained on a regular basis 4: PD programs at ASOO and AZOO revamped 5: National qualifications framework adopted 6: Higher caliber candidates attracted to teaching 7: Classroom observation piloted and evaluated		

6) Make greater use of data to inform policy-making and employ soft policy instruments to support reform implementation

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Define a strategy to implement additional standardized assessments in primary and/or lower secondary education 2. Change legislation as needed 3. Conduct other studies in areas that could benefit the most from additional data to inform policy making (e.g., optimal level of teachers (see above) and the key factors influencing and holding back student performance in PISA) 4. Start using modern policy tools to nudge behavior in desired directions with greater frequency 5. Implement new standardized assessments 6. Revise curricula, target teacher training, improve detection system for at-risk students based on results of standardized tests and other data collection methods	1: Strategy on standardized assessments developed and approved 2: Legislation changed as needed 3: Plans implemented to collect data on a more regular basis 4: Policy tools such as incentives, formula funding, etc. used more frequently 5: Additional standardized exam(s) implemented 6: Data from standardized assessments used to inform policy	National funds European Structural and Investment Fund; Structural Reform Support Programme (SRSP) European Social Fund (ESF); National funding	Quality; Governance

7) Increase autonomy to local education authorities and schools, accompanied by greater accountability for results

Starting from	Sub-actions	Milestone	Resource(s)	Area
2020	1. Conduct a review of rules and procedures to be followed by local authorities and identify areas for greater autonomy	1: Areas identified for greater autonomy at the local level	National funds; EU funds	Governance; Efficiency

	(and accountability when needed) 2. Build capacity at local levels 3. Use incentives and other tools to nudge behavior likely to result in better outcomes 4. Increasingly delegate more responsibilities to schools and local authorities	2: Capacity built at the local level for new responsibilities 3: Greater range of tools beyond legislation used to direct behavior 4: More responsibility delegated to local levels with appropriate accountability		

6.3 VET, Adult Education and Lifelong Learning

1) Ensure coordination and key decision-making in VET and adult education are done at the national level

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Identify department or institution at the national level best positioned to provide this role 2. Identify key decisions and processes that would benefit the most from coordination at the national level 3. Approve required legislation (and ensure *de-facto* authority at the national level) 4. Define funding responsibilities, secure adequate funding and transfer mechanism to local level	1: National department or agency identified 2: Areas for national decision-making and funding identified 3: Legislation adjustments made 4: Funding mechanism defined, funding secured	National funds; EU funds; additional funds TBD	Governance; Finance

2) Reform VET programs to better respond to the needs of the labor market

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Push forward with revision of curricula based on current occupational and qualification standards/develop new standards as required 2. Train teachers on new curricula and to address other deficiencies in technical and pedagogical competencies and close the gap in competencies of local VET personnel (principals, support staff, etc.) 3. Design strategies to better engage and serve employers in VET and adult education 4. Provide close supervision and support to centers of competence to ensure excellence and relevance of offerings	1: New VET curricula based on updated standards developed 2: Teachers trained 3: Employer strategies developed 4: Centers of competence launched with offerings that meets the needs of a demand-driven VET system 5: VET staff beyond teachers trained 6: VET's image improved	National funds; EU funds; additional funds TBD	Capacity Building

	5. Launch campaign to improve image of VET in parallel to quality improvement measures			

3) Develop a plan of action to address challenges and opportunities of 3-year programs

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	6. Prepare a study to clearly identify strengths, weaknesses, opportunities and threats to the 3-year track (including disincentives and barriers perceived by prospective students and employers) in order to point the way forward 7. Develop a plan to reform 3-year programs based on study above	1: Study of 3-year programs prepared 2: Plan of action to improve the quality and relevance of 3-year programs developed, validated and required funding secured	National funds; EU funds; additional funds TBD	Data/Planning; Finance

4) Create opportunities and conditions for increased participation of target groups in lifelong learning

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Develop action plan to address key barriers to increase participation in lifelong learning activities, especially for those disadvantaged, in collaboration with the scientific community 2. Improve quality and relevance of CVET 3. Increase funding for programs targeting key populations	1: Action plan based on strengthened implementation of Croatia's framework for lifelong learning created 2: Funding secured 3: Complete preparations for PIAAC, implement the assessment and use the data generated to inform improvements to the system	National funds; EU funds; additional funds TBD	Access; Finance; Data

5) Implement comprehensive changes to 3-year programs

Starting from	Sub-actions	Milestone	Resource(s)	Area
2021	1. Implement series of actions defined in study of 3-year track conducted within the next 3 years (see above)	1: TBD/As recommended by study 2: Implement measures aimed at providing adjustment assistance (e.g., retraining) to teachers and other professionals engaged in programs to be merged, discontinued or transformed	National funds; EU funds; additional funds TBD	Governance; Quality; Finance

6) Implement a quality assurance system to improve learning and employment outcomes of adult education

Starting from	Sub-actions	Milestone	Resource(s)	Area
2022	1. Develop a quality assurance mechanism for Adult Education 2. Implement key elements of quality assurance system, including closer monitoring of providers, a more rigorous certification process and an integrated register of providers	1: Quality assurance system of Adult Education developed 2: Mechanisms and actions implemented	National funds; EU funds; additional funds TBD	Governance; Quality

7) Complete VET reform to encompass all sectors and courses

Starting from	Sub-actions	Milestone	Resource(s)	Area
2025	1. Continue to work on pending reforms to improve the quality and relevance of VET and to include all sectors and courses 2. Strengthen relationships with the productive sector to maintain VET offerings up-to-date and relevant and correct course when necessary	1: Mismatches of skills in remaining sectors addressed 2: Functioning mechanism to involve the productive sector in VET decisions 3: VET teachers with updated technical and pedagogic competences 4: Others as needed	National funds; EU funds; additional funds TBD	Quality; Capacity Building; others

6.4 Higher Education

1) Improve the HE quality assurance system

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2 2019, Q2 2019, Q3 2019, Q2	1. Develop a new concept for initial accreditation of study programs using CROQF. 2. Develop a new concept for reaccreditation of HE institutions that combines institutional evaluation with the evaluation of study programs using CROQF. 3. Develop a new concept for the implementation of the RPL in HE. 4. Improve quality assurance regulations needed for the proposed approach.	2020, Q3: Concept and procedures defined. 2020, Q2: Concept and procedures defined, with a stronger focus on study programs. 2021, Q4: Concept and procedures defined. 2021, Q2: Improved act on quality assurance in HE issued	National budget	Quality

2) Improve legal framework for HE

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2	1. Commission requirements and expected impacts analysis for a new Act.	2019, Q3: Analysis published for a new Act 2020, Q4: New Act on Scientific Activity and HE including, among others, regulations for a more competitive hiring and promotion system, financing based on results, and functional integration of non-integrated universities.	National budget	Governance
2019, Q2	2. Organize wide consultations involving all stakeholders.			
2019, Q2	3. Create a new act and related bylaws. Secure consistency with other acts.			

3) Improve managerial and leadership capacity of middle and top management in HE institutions

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q3 2020, Q1 2020, Q2 2020, Q3	1. Assign responsibility for improving managerial and leadership capacity to an existing entity (a HE institution, ASHE, etc.). 2. Implement continuous education program. 3. Create support networks of middle and top managers at HE institutions. 4. Create a network of experts providing tailored advice and technical support.	2020, Q1: Organizational arrangement made at the national level 2020, Q3: Implementation of a continuous education program started. 2020, Q4: Networks are operational and start their activities.	Use already existing structures and programs, as those developed at the University of Rijeka, on which to establish this support system. Explore regional dimension of this work in a later stage of development. National budget and HE institutions' budgets.	Capacity building; Governance

4) Improve HE graduate employability

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2	1. Monitor graduates' transition into the labor market through a graduate tracking system.	2019, Q3: Participation in the pilot pan-European *Eurograduate* tracking system. 2020, Q2: First forecast completed. 2021, Q1: Graduate tracking system introduced.	National budget; European Social Fund Create smaller projects out of sub-actions and finance them through Erasmus+ program.	Quality; Data
2019, Q2	2. Introduce labor market needs forecasting.			
2019, Q2	3. Involve employers in HE governance and curriculum planning.			
2019, Q2	4. Include practical training and work placements in HE programs.			
2019, Q3	5. Improve career guidance services at HE institutions.			

2020, Q1	6. Match admissions quota with labor market needs.			

5) Introduce a three-pillar model for state funding of HE institutions: (1) basic funding , (2) performance-oriented funding, (3) innovation-oriented funding

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2 2019, Q2 2020, Q1 2020, Q1 2020, Q2	1. Use peer counseling for exchange of best practices of allocation of state funding in the EU. 2. Explore strategic basis and define components and indicators of performance-oriented and innovation-oriented funding. 3. Develop regulations needed for the implementation. 4. Build organizational capacity at HE institutions and MSE for the implementation. 5. Establish monitoring and evaluation system.	2019, Q2: Publish a synthesis of the implementation of previous funding agreements. 2020, Q4: Definition of main components of the three-pillar model, taking into account the impact of high-skilled emigration on HE policies. 2021, Q3: Implementation of funding formula with performance indicators. Funding agreements with HE institutions signed.	National budget; EU funds under innovation pillar. Use European Commission's technical assistance and peer counseling.	Finance

6) Improve student support from the state

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2	1. Increase the number and support amount of state scholarships. 2. Design student support taking into account the impact of high-skilled emigration on HE policies. 3. Redirect indirect support (meal subsidies) into direct scholarships. 4. Improve tax regulations to stimulate scholarship donation. 5. Implement effective monitoring and evaluation of the support.	2020, Q2: Annual reports on impact of state scholarships, particularly relating to disadvantaged student groups. 2021, Q1: Create a national database of all public (national and local government) scholarships as part of monitoring sub-action. 2024, Q1: Meal subsidies phased out, funds redirected into state scholarships.	National budget; European Social Fund	Equity; Finance

7) Use CROQF to improve HE qualifications and curriculum

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2 – 2030	1. Develop occupation and qualification standards and enter them into the CROQF Register. 2. Develop curriculum based on qualification and occupation standards from the CROQF Register.	2019, Q3-2030: Annual progress reports with monitoring outcomes of sub-actions published. 2019, Q2-2022, Q2: All components of the RPL system developed.	National budget; European Social Fund	Quality

	3. Develop a system for recognition of prior learning (RPL) and start implementation.	2022, Q1-2030: RPL in HE implemented.		

8) Enhance equity and increase HE attainment rate

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2 – 2030	1. Collect data and analyze impact of high-skilled emigration on equity and HE attainment. 2. Integrate in the Plan policies on: widening access, improving retention and completion through continuous support mechanisms made available to students at risk, graduate employability, funding, equity-sensitive quality assurance. 3. Secure effective monitoring and evaluation.	2019, Q2: MSE adopted the Plan. 2019, Q3: Organizational structure includes the National Group for the Enhancement of Social Dimension as cross-sectoral expert body. 2021, Q1: Publish analysis of the impact of high-skilled emigration on equity and HE attainment. 2019, Q4-2030: Monitoring of the Plan includes calculating completion rates using the true-cohort method at the end of a cycle and drop-out rates annually for each cohort.	National budget; European Social Fund Create smaller projects out of sub-actions and finance them through Erasmus+ program. Use European Commission's technical assistance and peer counseling.	Equity; Attainment

6.5 Science

1) Improve the quality of support programs for research and innovation

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Conduct a systematic review of all research and innovation public support programs.	2020 Q2: Systematic review of all research and innovation public support completed.	EU funds, national funds	Research and innovation policy

2) Improve working conditions in order to retain human resources in RDI and attract foreign researchers – stimulate and support researchers

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2	1. Adopt new approach to career advancement at PROs at the national level – enabling career advancement based on the assessment of research impact, technology transfer, teaching achievements, project success, international experience, tenure track possibility	2021, Q1: New Act on Scientific Activity and HE including a more competitive and project based system of career advancement at PROs 2021, Q1: Measures identified, budget for the next programming period drafted 2021, Q1: New mechanisms in place with allocated budgets 2020, Q2: Knowledge sharing platform launched	National budget; ESIF, World Bank	Research and innovation policy

Starting from	Sub-actions	Milestone	Resource(s)	Area
	2. Identify measures that enable research excellence for the programming period 2021-2027 3. Introduce mechanisms to retain human resources in RDI, create career opportunities and attract foreign researchers and facilitate their arrival and employment 4. Unity through Knowledge 2.0 (flagship project)	2021, Q1: ERDF funding secured for expansion of activities 2021, Q2: Strategic plan revised		

3) Enhance collaboration between science and industry through fostering technology transfer and research commercialization

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2	1. Design and implementation of support mechanisms for (collaborative) research projects, which are market-oriented and/or target needs of economy 2. Development of technology transfer organization/s	2020, Q4 / 2021 New support mechanisms identified with allocated budget 2021, Q1 Support mechanism identified with allocated budget	National budget; ESIF, World Bank	Research and innovation policy

4) Improve access to finance for HE and RDI

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2	1. Adopt a strategic management approach, in line with the new Act on HE and Scientific Activity 2. Review and reform funding arrangements (introduction of three-pillar model) 3. Increase budget allocations for competitive grants to at least 0.15 percent of GDP 4. Mobilize resources of other ministries and state-owned companies for RDI 5 Analysis of gaps between available international large-scale funding programs (e.g. Horizon 2020) and needs of Croatian applicants; design of new mechanisms supporting Croatian applicants and bridging the identified gaps	2020, Q1: Guidelines for governance reform drafted 2020, Q1: Changes in internal acts of HE institutions and PRO drafted 2019, Q4: New funding arrangements defined and included in budget for 2019 2021, Q1: 2020 budget proposal drafted (then annually) 2021, Q1: 2020 budget proposal drafted (then annually) 2020, Q4: Analysis completed, and gaps identified 2021, Q1: New supporting mechanisms developed, and budget proposal drafted	National budget; ESIF, World Bank	Research and innovation policy

5) Institutional capacity: policy evaluation, implementation, and monitoring

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. Create a specialized institution and/or Technology Transfer Office (TTO) network with a core focus to support innovation environment in Croatia. 2. Build the capacity to manage research and innovation policy - design, implementation, monitoring, and evaluation. 3. Strengthen impact evaluation.	2022 Q2: Roadmap for capacity building in management of research and innovation policy adopted. 2022 Q2: Roadmap for capacity building in impact evaluation adopted. 2022 Q4: Institution with a core focus to support innovation environment in Croatia established.	EU funds, national funds	Research and Innovation policy

5) Improve efficiency of public research organizations in performing excellent research

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019, Q2	1. Review legal status of public research organizations with the aim of increasing their performance and the autonomy and accountability of their directors 2. Advance the consolidation of public research organizations	2020, Q1: Revision of the legal status of public research institutes completed, autonomy and accountability of directors increased 2020, Q2: Action plan for consolidation of public research organizations adopted 2020, Q4: Mechanisms for monitoring of consolidation process and results defined and implemented 2025, Q3: Review of the consolidation process completed, recommendations for the next medium-term period introduced	National budget; ESIF, World Bank	Research and innovation policy

6) Develop a functional innovation system

Starting from	Sub-actions	Milestone	Resource(s)	Area
2019	1. National Development Strategy 2. Reform public administration 3. Develop and adopt a business competitiveness program 4. Complete public STI expenditure review 5. Strengthen the monitoring and evaluation system 6. Develop and implement new policy measures	2019: National Development Strategy developed/adopted Q1, 2021: Implementation of Strategy for the Development of Public Administration reviewed Q3, 2021: New public administration reform strategy drafted/adopted 2019, Q4: Business competitiveness program adopted 2020, 2Q: project implementation ended 2021, Q3: RDI policies and performance form reviewed 2021, Q4:	National budget; ESIF	Research and innovation policy

		New/revised policy measures developed		

7 Proposals for strategic ("Flagship") projects

7.1 ECEC Governance and Teacher Policies

a) **Description of flagship project:** Revision of governance of ECEC system to allow for substantial expansion of ECEC coverage in a relatively short period of time. Focus on a more prominent role for the central government to rollout a national plan while developing an efficient balance of responsibilities among the different levels of government. Involves revisions to the financing mechanism of ECEC to ensure poorer regions are able to expand and run pre-primary education at an adequate level of coverage and quality. Will take into consideration existing and forthcoming data (e.g., UNICEF study on pre-primary education expected in 2019) and will focus on implementation of changes. The Teacher Policies component will address the requirements to expand initial ECEC teacher education, to standardize compensation and to resolve teacher deployment issues. Emphasis will be placed on increasing the capacity of teacher training programs and institutions to accommodate the increased demand for training.

b) **Project's relevance to national strategic framework:** Improved governance and teacher policies in ECEC are aimed at increasing access to pre-primary education, including to the most disadvantaged children. This translates into young Croatian children who are better prepared for learning at school and through life, with implications for the economy and broader society.

c) **Economic potential and exploitation:** Children who have solid foundational competencies are more likely to develop into more productive adults, leading to greater economic growth. Studies of very high-quality pre-primary programs have shown long-term advantages to individuals and countries related to cognitive development, employment rates, higher earnings, lower incarceration rates, and less use of social services, among others.[132]

d) **Sustainability:** Governance restructuring and revisions to financing arrangements (larger participation of the national government in ECEC funding) will have sustainability as a central component (e.g., one of the reasons the current financing arrangements need revision is for lack of sustainability in a context of ECEC expansion). The increased capacity of ECEC institutions should be scaled to meet demand for new teachers through the years (e.g., a rapid increase due to accelerated expansion will be followed by an eventual decrease in the need to train new teachers, also due to declining demographics). Eventual standardization of ECEC teacher compensation will take financial sustainability into account.

e) Duration: 2-3 years

f) Estimated amount of funding required: TBD

g) **Preconditions - points for consideration before the project can begin:** Recognition of challenges that need to be addressed by the project (e.g., lack of coordination and strategic direction at ECEC on the national level, inadequate financial capacity of many towns and municipalities to expand ECEC, inadequate numbers of teachers as a major obstacle to increased pre-primary coverage, etc.),

[132] Schweinhart, Xiang, Barnett, Belfield and Nores, 2005

political willingness and ability to overcome eventual local resistance to changes in ECEC governance.

h) **Project leader:** MSE

i) **Beneficiaries:** Young children and families, ECEC teachers and support professionals, poor towns and municipalities, MSE.

7.2 Greater efficiency, institutional capacity and quality in order to improve learning outcomes

a) **Description of flagship project:** A project to increase the quality and efficiency of basic education in order to improve learning outcomes, with a focus on optimizing the school network, increased instruction time, introduction of modern public sector management practices employed in other EU countries and improved assessment of learning outcomes. The project could aim to:

- Develop and introduce "whole day school" model(s) to increase instructional time and improve efficiency
  - May require investments in infrastructure
- Identify areas for greatest efficiency gains in management of primary and secondary education and introduce appropriate instruments to enable change. This would likely involve:
  - per student financing/block grants to schools, along with more autonomy to enable schools and local authorities to make better use of their resources and be accountable for them
  - providing infrastructure grants to local authorities to incentivize consolidation of classes and schools to facilitate whole day schooling and improved instructional hours
- Introduce learning assessments at different levels of the system
  - Potential to align with new curriculum standards
  - Opportunity to develop a comprehensive data collection system, focused on student and school performance
- Embed a rigorous impact evaluation around these changes, focusing on students' learning outcomes

b) **Project's relevance to national strategic framework:** A more efficient school network and better management practices can lead to cost savings and the possibility to increase instruction time aiming to improve student learning outcomes, which is critical to human capital development in the country and aligned with the national strategic framework

c) **Economic potential and exploitation:** Cost savings in the medium to long-run from a leaner, smarter school network and potential for better learning outcomes, which could lead to increased productivity and economic growth

d) **Sustainability:** An adequate network of schools compatible with the needs of the country and its shrinking population would be significantly more sustainable than the current situation.

e) **Duration:** 4-5 years (first phase)

f) **Estimated amount of funding required:** 1.000.000.000,00 EUR (approximate estimation by MSE, detailed analysis needed)

g) **Preconditions - points for consideration before the project can begin:** Analysis of experiences of other EU countries that have increased instruction time, consultations with broader stakeholders.

a) **Project leader:** MSE
b) **Beneficiaries:** Students

7.3 Better monitoring of education processes through the use of technology – EduHR

a) **Description of flagship project:**

- A technology-oriented project that envisages the implementation of complementary infrastructure and soft activities to achieve the following results, which are aligned with the 2030 National Development Strategy:
- Automation and further digitization of teaching and administrative processes to create the preconditions for more effective monitoring of teaching and quality education;
- Implementation of intelligent networks that enable fast and efficient deployment of advanced user-oriented services and prevent cyber-attacks, ensuring the use of ICT in a protected environment;
- Personalized access to ICT resources for education in secure Cybernetic environments accessible to everyone and addressing the real needs of each individual, regardless of the specificity of their needs and consequently soften the digital gap;
- Improvement of the competences of education staff for the use of ICT in education, including getting acquainted with modern teaching methods through ICT in initial education of teachers;
- Further improvement to teaching analytics and related infrastructure to enhance prediction and better monitoring of human resources (e.g., need for professional development) as a basis for guiding educational and other policies;

Long term digital transformation of primary and secondary education institutions and systems (including VET schools) through major projects aiming at providing infrastructure, applications and training, as well as implementation of innovative technological solutions (in particular artificial intelligence) as one of the pre-requisites of future development, quality and equity of the education system.

b) **Project's relevance to national strategic framework:** The ultimate goal of the project is to improve access, quality and relevance of education for Croatian students, which is directly aligned to the country's national development strategy.

c) **Economic potential and exploitation:** The project will lead to greater efficiency in decision-making in the education sector, which will improve the quality of education offered to students. This is expected to lead to better learning outcomes, which influence productivity and life outcomes.

d) **Sustainability:** The project will contribute to the modernization of the education system and to meeting its information needs. Training users will contribute to the adequate utilization of the system and its usefulness.

e) Duration: TBD

f) **Estimated amount of funding required:** 150.000.000,00 EUR (approximate estimation by MSE, detailed analysis needed)

g) **Preconditions - points for consideration before the project can begin:** TBD

h) **Project leader:** Croatian Academic and Research Network (CARNET)

i) **Beneficiaries:** Students, teachers and education officials

7.4 Revamping of 3-year VET track

a) **Description of flagship project:** The 3-year VET track needs a comprehensive turn-around in terms of delivery, duration, structure, mobility, content and selection, after having remained largely unchanged for more than 50 years. This will require a detailed study of the weaknesses and strengths of these courses and the opportunities in this area, both from the student and employer perspectives, given the shrinking of the population, the current and projected absorption capacity of local markets, the need for work-based learning, among others. The current context represents an opportunity to revamp and make the 3-year VET programs leaner, more effective, and attractive. The possibility of improving the vertical integration of this track with HE should be analyzed. Similarly deserving of attention is the possibility of allowing students to acquire more key competences for lifelong learning and delay specialization into specific occupations (first selecting a broader sector of VET study) until later in their studies, in order for students to acquire more general competencies useful throughout their careers and to more easily transition to HE if desired, likely increasing the attractiveness of 3-year programs. Local concerns about the future of teachers and other professionals currently employed in 3-year programs should be taken into consideration and a program to retrain or reintegrate these professionals in more effective ways could be considered, but such concerns should not prevent required changes to make the programs more relevant and effective.

b) **Project's relevance to national strategic framework:** The 3-year track of VET is marked by dwindling interest from students and low prestige overall, limited WBL opportunities, outdated curricula, teachers disconnected from needs and practices of the labor market, over-specialization and cumbersome vertical integration with HE. Within the recent demographic and economic context, this has resulted in annual enrolment steadily decreasing from 23.5 thousand in 1995 to 8.8 thousand in 2017. Functioning of this VET track is essential for successfully pursuing of the smart specialization strategy in the full skills spectrum.

c) **Economic potential and exploitation:** Despite schools struggling to enroll youth in 3-year VET courses, employer associations and the Croatian Employment Service both report labor shortages in related occupations in construction, tourism and personal services, transport, mechanical and electrical engineering. Matching demand and increasing the quality of training for those occupations would reduce firm training costs, increase productivity and help attract investments to the Croatian economy.

d) **Sustainability:** The 3-year VET track is not sustainable in its current form. Its reform is necessary to ensure functionality and sustainability of broader VET system.

e) **Duration:** 1-3 years study and development, 3 years implementation

f) **Estimated amount of funding required:** TBD

g) Preconditions – points for consideration before the project can begin: Changes to this track should take into consideration other VET developments, such as design of new CROQF standards, introduction of competence centers, an innovations in WBL provision, etc.

h) **Project leader:** MSE

i) Beneficiaries: Students, who would get more attractive VET track; schools, that would face fewer problems in providing such courses; and employers, that would have access to fit-to-learn graduates with relevant vocational profiles

7.5 Establishing new and supporting the work of existing regional centers of competence in vocational education in priority sectors of vocational education

a) Description of flagship project:

- This project will continue targeting investment in already established regional competence centers (tourism and hospitality, engineering, electrical engineering and computing, agriculture and health) and initiate the process of modernizing and transforming the vocational education system in other sectors.
- Regional Competence Centers (a total of 25) are places of excellence in vocational education and training in which regular vocational education, professional training and lifelong learning programs as well as other forms of formal and informal education will be implemented. EU Structural Funds will provide targeted financial support for the reconstruction, restoration and adaptation of centers, procurement of specialized equipment, development of human resources and professional capacities, creation and modernization of various types of programs to be implemented in centers and other activities aimed at establishment of their organization's work and development. Support will also be given to additional activities of economic and educational cooperation aimed at developing and implementing new technologies in the processes of development, testing and improvement of various products and services.
- Qualitative and continuous secondary vocational education that will be implemented in the centers will target pupils, adult learners, students, teachers and mentors, employed and unemployed persons, as well as persons with disabilities and disadvantaged students. The core features of competence centers are innovative learning models, excellence of teachers, mentors, and high-quality infrastructure, constructive and creative collaboration with social partners, the public sector and economic entities and other interested institutions of the wider community.

b) **Estimated amount of funding required:** 100.000.000,00 EUR (approximate estimation by MSE, detailed analysis needed)

c) Project leader: MSE

7.6 Adult Education Quality Assurance System

d) **Description of flagship project:** Development and implementation of a quality assurance system for adult education programs. The system will be closely linked to CROQF, occupational and qualification standards, tracer studies, etc. It will use internal and external evaluations to certify and monitor providers and will make use of an integrated register of providers to increase transparency and improve course and provider selection by students. Low quality programs will be discontinued and providers that do not meet minimum requirements closed. The system should include a clear way of communicating performance of providers to users, perhaps using a start system to facilitate understanding.

e) **Project's relevance to national strategic framework:** Croatia ranks at the bottom of the EU in participation in lifelong learning. With a rapid aging population and a decrease in the size of its workforce, workers need to become more productive for standards of living to be maintained. The project would contribute to a better functioning adult education system and higher human capital.

f) **Economic potential and exploitation:** A quality assurance system for adult education programs would be designed to improve the relevance and quality of courses, leading to improved learning outcomes and eventually more skilled workers and knowledgeable citizens, contributing to economic growth and societal wellbeing.

g) **Sustainability:** Sustainability of the system will require continuous commitment of MSE and of the administering institution (e.g., to withhold certifications). Financial sustainability of the system will depend on the budget being allocated to the appropriate agency.

h) **Duration:** 3 years

i) **Estimated amount of funding required:** TBD

j) **Preconditions - points for consideration before the project can begin:** Croatia's VET System Development Programme (2016-2020) had already proposed a quality assurance system for adult education. Approval of a new adult education law, drafted in 2016, would provide a stronger legal framework for the project.

k) **Project leader:** MSE

l) **Beneficiaries:** Adult learners, adult education providers, employers, MSE.

7.7 Development of HE in the field of Information-Communication Technology and Robotics

a) **Description of flagship project:** Information and Communication Technology (ICT) and Robotics are the basis for the development of high-tech companies and their high-tech products. Such companies and their products could have a positive impact on the competitiveness of the Croatian economy. Also, a lack of graduates in STEM disciplines constrains productivity growth in Croatia.[133] The country is extremely deficient in the number of ICT and robotics students, for example. Also, Croatia does not have a sufficient number of ICT and robotics study programs and the quality of

[133] World Bank, 2018e

existing programs is not sufficient – this is one of the reasons why the students with highest potential in ICT and robotics often feel the need to study abroad. At the same time, there is an increasing interest in studying ICT and robotics and there is an increasing interest among employers to employ students with ICT and robotics background. This project aims at solving the abovementioned problem by expanding the capacity and increasing the quality of ICT and robotics study programs at HE institutions. The project will be carried out at Croatian HE institutions that have study programs in ICT and robotics. Each institution will increase the number of students in these fields and the quality of their learning outcomes. HE institutions will also improve the equipment needed for scientific research in ICT and robotics.

b) **Project's relevance to national strategic framework:** The project is aligned with the Strategy for Education, Science and Technology and the Strategy for Fostering Innovation in the Republic of Croatia 2014 -2020. STEM-related activities are particularly important for the long-term development of the Croatian high-tech industry.

c) **Economic potential and exploitation:** The improved quality of education and increased number of graduates in ICT and robotics will have a positive impact on the country's economic development because of the creation of new and better ICT services and new jobs, which will create more sustainable digital environments.

d) **Sustainability:** Project depends upon public financing from national and EU sources.

   a) Duration: 5 years

e) **Estimated amount of funding required:** 150.000.000,00 EUR (approximate estimation by MSE, detailed analysis needed)

f) **Preconditions - points for consideration before the project can begin:** Projects for individual HE institutions ready to be applied and implemented, with all necessary permits and feasibility studies.

g) **Project leader:** MSE, ICT and robotics departments of HE institutions

h) **Beneficiaries:** Students, higher education institutions

7.8 Enhancing research performance of HE institutions and PROs to competitively participate in international scientific organizations

a) **Description of flagship project:** The aim of this project is to internationalize the research of HE institutions and PROs, so that they can competitively participate in international scientific organizations. This consists of engaging in large ESFRI projects, ERIC networks (ESFRI), CERN, ESA, research cooperation at unique research facilities located both within and outside the EU. Activities can include major infrastructural investments (equipment, facilities, and similar), project activities, membership fees, financing of scientists and engineers, and related activities. Related measure to this project includes:

- Enhancing the performances of HE institutions and PROs in international projects by supporting quality project proposals in Horizon Europe that do not get funding, including financing of Horizon Europe projects with a Seal of Excellence.
- Support for existing TTOs and/or creation of a national body to aid technology transfer

b) **Project's relevance to national strategic framework**: The project is aligned with the Strategy for Education, Science and Technology and the Strategy for Fostering Innovation in the Republic of Croatia 2014 -2020. A key aspect of the strategy is the international relevance of the research performed, and cooperation with the industry.

c) **Economic potential and exploitation:** The project will significantly increase the quality of Croatian scientists and engineers, bringing them into active contact with the newest technologies. Furthermore, the activities will include the design, development, construction, running and maintenance of state-of-the-art technologies – such activities often have significant long-term economic benefits (e.g., purchases, knowledge spillovers, spin offs) for the country that implements them. Improved technology transfer performance will also be facilitated.

d) **Sustainability:** Project depends upon public financing from national and EU sources

e) **Duration:** 10 years

f) **Estimated amount of funding required:** 350.000.000,00 EUR (approximate estimation by MSE, detailed analysis needed)

g) **Preconditions - points for consideration before the project can begin:** TBC

h) **Project leader:** MSE, HE institutions and PRO

i) **Beneficiaries:** HE institutions and PRO, researchers, high-tech companies, engineers, international collaborations

7.9 Centers of excellence in science

a) **Description of flagship project:** The aim of this project is to finance the formation of new centers of excellence, or support existing ones, in STEM-related fields.

b) **Project's relevance to national strategic framework**: The project is aligned with the Strategy for Education, Science and Technology and the Strategy for Fostering Innovation in the Republic of Croatia 2014 -2020. A key aspect of the strategy is the international relevance of the research performed, and cooperation with the industry.

c) **Economic potential and exploitation:** The project will significantly increase the quality of Croatian scientists and engineers, and bring them in active contact with the newest technologies.

d) **Sustainability:** Project depends upon public financing from national and EU sources.

e) **Duration:** 5 years

f) **Estimated amount of funding required:** 50.000.000,00 EUR (approximate estimation by MSE, detailed analysis needed)

g) **Preconditions - points for consideration before the project can begin:** TBD.

h) Project leader: MSE, consortia of HE institutions and PRO

i) **Beneficiaries:** HE institutions and PRO, researchers, high-tech companies, engineers, international collaborations

7.10 Unity through Knowledge 2.0 (UKF 2.0)

a) **Description of flagship project:** The project aims to take advantage of the experience of the initial UKF project (established in 2007 within the Science and Technology Project supported by the World Bank) and broaden the activities implemented by UKF. In addition to installation grants, research collaborations and outreach towards Croatian science diaspora, the project should also include actively supporting the participation of Croatian public and private entities in Horizon 2020/Horizon Europe (including a representative office in Brussels), as well as support to formation of strategic partnerships of Croatian HE institutions and PROs (including consortia such as centers of research excellence) with international leaders in the specific fields they have put forward in their strategic research programs which are aligned with national and EU policy priorities. The project should be based on a thorough analysis and an action plan, and could also include supporting activities (e.g., policy analysis, capacity building, communication and dissemination, monitoring and evaluation).

b) **Project's relevance to national strategic framework:** The project is aligned with the Strategy for Education, Science and Technology and the Strategy for Fostering Innovation in the Republic of Croatia 2014 -2020

c) **Economic potential and exploitation:** The project aims to support research excellence, networking and the internationalization of Croatian HE institutions and PROs, in order to expand their opportunities to foster the careers of young researchers, establish excellent research groups, form research collaborations and partnerships and become more active in the international research arena. Its economic potential and exploitation opportunities will primarily depend on the quality of projects submitted, financed and implemented, as well as on the results of these projects and their economic implications. However, given the emphasis of Horizon 2020 on research dissemination and exploitation, it is likely that the results of some projects will successfully reach the market.

d) **Sustainability:** Project depends on public financing from national and EU sources.

e) **Duration:** 5 years (possible continuation dependent upon evaluation)

f) **Estimated amount of funding required:** TBD (initial UKF had a budget of EUR 7.8 million); it is recommended that the activities start as soon as possible, at a smaller scale, which will enable piloting actions with minimal (national and ESIF) resources. As more resources become available in the next programming period, the activities should be expanded.

g) **Preconditions - points for consideration before the project can begin:** N/A

h) **Project leader:** MSE; Croatian Science Foundation

i) **Beneficiaries:** Students, higher education institutions, public research organizations, companies participating in RDI activities

7.11 Modernizing HE system to meet societal and economic needs of the 21st century

a) **Description of flagship project:**

1. Some of the following could be stand-alone flagship projects or be part of a flagship project:

2. Support for the creation of a new and modern legal act for HE and research as the centerpiece of the HE and research statutory framework.
3. Enhancement of the financing system for HE and of research by implementing a three-pillar model of state funding: (1) basic funding, (2) performance-oriented funding, (3) innovation-oriented funding.
4. Introduction of a graduate tracking system to monitor HE graduates' transition into the labor market.
5. Training for the coherent implementation of a learning outcomes approach and related ECTS credits allocation in curricula design and delivery. Effective alignment of study programs with qualification and occupation standards from the CROQF Register.
6. Scholarships for students, and enabling access to higher education for all members of society

b) **Project's relevance to national strategic framework:** The key act of Croatian tertiary education is the 2003 Act on Scientific Activity and Higher Education, which has been amended and supplemented 12 times. The addition of important new structural tools [establishment of a quality assurance system (2009), CROQF (2013), and introduction of funding agreements (2012)] to the act has created a complex legal framework, which needs a fundamental overhaul with a new act, supporting the future development of Croatian HE and research. One of the key goals of the national Strategy for Education, Science and Technology is to ensure an effective system of financing of HE and research (objective 4). Particular emphasis lies on developing a new generation of funding agreements. The first objective of the Strategy stresses the importance of curricula revisions through aligning learning outcomes with competencies necessary in certain occupations, using CROQF. The Strategy contains also objectives for the enhancement of study programs to increase their relevance for the labor market (objectives 1 and 2). Objective 2 also refers to the necessity of improving the management of HE institutions.

c) **Economic potential and exploitation:** The improvement of the legal and funding framework for HE and research will bring more coherence and consistency into the system, improving the efficient and effective use of public resources. It will allow for the strategic steering of both the HE system and of HE institutions. State-of-the-art training of HE institutions' employees and sharing of global best practices in implementing a learning outcomes approach in curriculum design would assure that public resources invested in developing study programs and the CROQF contribute to enhanced relevance and quality of HE.

d) **Sustainability:** A graduate tracking system (GTS) is a valuable tool for evaluating the employability of HE graduates as well as the relevance and quality of study programs. A GTS allows measuring the length of the job search period, graduates' job satisfaction, adequacy of jobs for the obtained qualification, and the match between graduates' skills and job requirements, which allows evidence-based policies and the making of better-informed choices by students and their families. Given the current mass emigration trends, Croatia may in fact be producing a significant amount of high-skilled labor for Germany, Austria, and Ireland, the most popular destination countries for Croatian emigrants. GTS could collect data about high-skilled emigration flows and the reasons for emigration, thus helping to create effective policies that would address the current problem of mass emigration.

e) **Duration:** Multiple durations depending on project.

f) Estimated amount of funding required: TBD

g) Preconditions – points for consideration before the project can begin: The current non-integrated structure of the biggest Croatian public universities is an obstacle for strategically steering both the HE system and HE institutions. It hinders the effective implementation of performance-oriented funding policies that foster strategic specialization.

h) Project leader: MSE

i) **Beneficiaries:** HE and research institutions, MSE, employers as well as other stakeholders (including students and their families)

8 References

Agency for Science and Higher Education [ASHE], 2018. “Analiza stanja i potreba u srednjoškolskom odgoju i obrazovanju vezanih uz informiranje o visokoškolskim izborima i postupcima upisa na studijske programe preko Nacionalnog informacijskog sustava prijava na visoka učilišta (NISpVU).” Zagreb: Agency for Science and Higher Education.

Agency for Science and Higher Education [ASHE], 2017. “Analiza petogodišnjeg ciklusa reakreditacije visokih učilišta 2010-2015” [Analysis of the five-years reaccreditation cycle of higher education institutions 2010-2015]. Zagreb: Agency for Science and Higher Education.

Agency for Science and Higher Education [ASHE], 2014. “Postati student u Hrvatskoj.” Zagreb: Agency for Science and Higher Education.

Agency for VET and Adult Education, n.d.(a) “Strategic Framework for Promotion of Lifelong Learning in the Republic of Croatia 2017-2021.”

Antulić, S., Buljan Culej, J. (2017). Croatian Students’ Achievement in TIMSS 2015 Mathematics and Science Content Domains in the Context of Preprimary Education Attendance – The Implications for Improving Early Childhood Education and Care. In: Naučna konferencija TIMSS 2015: Rezultati i implikacije (TIMSS 2015: РЕЗУЛТАТИ И ИМПЛИКАЦИЈЕ): Book of Abstracts, Učiteljski fakultet Univerziteta u Beogradu, Beograd, 07. April 2017, pp. 11.

Arnhold, N., J. Kivistö, H. Vossensteyn, J. Weaver, and F. Ziegele, 2018. “World Bank Support to Higher Education in Latvia, Focus on Performance, Volume 1: System-Level Funding.” Washington DC: International Bank for Reconstruction and Development/The World Bank

Avvisati, F., 2018. "In which countries do the most highly qualified and experienced teachers teach in the most difficult schools?" PISA in Focus, No. 85, OECD Publishing, Paris, https://doi.org/10.1787/3ef99aba-en.

Bouillet, D., 2018. Beyond inclusion of early and preschool aged children. An analysis report on accessibility of the quality early and pre-school education and care for children in vulnerable situations in Croatia. Retrieved from: https://www.unicef.hr/wp-content/uploads/2018/12/S_one_strane_inkluzije_FINAL.pd

Bouillet D., 2017. “Croatia ECEC Workforce Profile.” In *Workforce Profiles in Systems of Early Childhood Education and Care in Europe*, edited by P. Oberhuemer and I. Schreyer. Retrived from: www.seepro.eu/English/Country_Reports.htm

Cap4App: Capacity for Apprenticeship. “Strukovno obrazovanje u RH.” Retrieved from https://www.dualnoobrazovanje.hr/strukovno-obrazovanje-u-rh

Continuous Vocational Training Survey (CVTS), n.d. EU harmonized CVTS, Eurostat tables trng_cvt_12s (participation) and trng_cvt_02n2 (reasons for not providing training)

Council of Europe, n.d. “Compass: Manual for Human Rights Education with Young People.” Retrieved from: https://www.coe.int/en/web/compass/education

Croatia Media Monitoring (Media Scan), Sept. 6, 2018

Croatian Bureau of Statistics, 2018. Report from May 2018, First Release, number 8.1.8

Croatian Bureau of Statistics, 2017. “Migration of population of republic of Croatia, 2017.” First release number: 7.1.2. Retrieved from: https://www.dzs.hr/Hrv_Eng/publication/2018/07-01-02_01_2018.htm

Croatian Bureau of Statistics, 2017. “Statistical Yearbook 2017.” Retrieved from https://www.dzs.hr/

Croatia Bureau of Statistics, various dates. Employment and Wages Statistical reports (various years). Table 3.2

Croatian Employment Service, 2018. “2017 Yearbook.”

Dobrotic, I., T. Matkovic and V. Menger, 2018. “Analysis of Accessibility, Quality, Capacity and Funding System – Early Childhood Education in Croatia.” Ministry of Demographics, Family, Youth and Social Policy.

Dougherty, C., 2005. “Why are the returns to schooling higher for women than for men?” Journal of Human Resources 40 (4):969-88.

Državni ured za reviziju, 2018. “Izvješće o obavljenoj reviziji učinkovitosti kapitalnih ulaganja u osnovne i srednje škole na području Republike Hrvatske.” Retrieved from: http://www.revizija.hr/datastore/filestore/170/KAPITALNA_ULAGANJA_U_OSNOVNE_I_SREDNJE_SKOLE.pdf

ETUC-CEEP-EFEE-ETUCE Project report, 2017. “Investment in Education and Training:Trends and Challenges, the Role of EU Policies and Financing from the Perspective of European and National Social Partners“. Retrieved from: https://www.cseeetuce.org/images/attachments/investment_in_education_and_training-etuc-ceep_0.pdf

European Commission, 2018a. “Council Recommendation on the 2018 National Reform Programme of Croatia and delivering a Council opinion on the 2018 Convergence Programme of Croatia.” Brussels, Council of the European Union.

European Commission, 2018b. “Towards a European Education Area by 2025.” Accessed September 2018: https://ec.europa.eu/commission/news/towards-european-education-area-2025-2017-nov-14_en

European Commission, 2018c. “Education and Training Monitor 2018: Croatia – Highlights.” Retrieved from: https://ec.europa.eu/education/sites/education/files/document-library-docs/et-monitor-factsheet-2018-croatia_en.pdf

European Commission, 2018d. “Education and Training Monitor 2018.” Retrieved from: https://ec.europa.eu/education/sites/education/files/document-library-docs/volume-1-2018-education-and-training-monitor-country-analysis.pdf

European Commission, n.d.(a). “About education policies.” Retrieved from: https://ec.europa.eu/education/policies/about-education-policies_en

European Commission, n.d.(b). “European Innovation Scoreboard 2018.” Retrieved from: https://ec.europa.eu/docsroom/documents/30281/attachments/1/translations/en/renditions/native

European Comission, 2017a. “Council Recommendation on the 2018 National Reform Programme of Croatia and delivering a Council opinion on the 2018 Convergence Programme of Croatia.” Brussels, Council of the European Union.

European Commission, 2017b. “Education and Training Monitor 2017.” Retrieved from: ec.europa.eu/education/monitor

European Commission, 2017c. “Education and Training Monitor 2017 – Croatia.” Retrieved from: ec.europa.eu/education/monitor

European Commission/EACEA/Eurydice, 2018. “The European Higher Education Area in 2018: Bologna Process Implementation Report.” Luxembourg: Publications Office of the European Union.

European Commission/EACEA/Eurydice, 2018b. “Recommended Annual Instruction Time in Full-time Compulsory Education in Europe – 2017/2018.” Eurydice – Facts and Figures. Luxembourg: Publications Office of the European Union. Retrieved from: https://eacea.ec.europa.eu/national-policies/eurydice/sites/eurydice/files/it_2017_2018_internet_0.pdf

European Commission/EACEA/Eurydice, 2015. “Assuring Quality in Education: Policies and Approaches to School Evaluation in Europe.” Eurydice Report. Luxembourg: Publications Office of the European Union.

European Commission, n.d. “Country Report Croatia 2015: Including an In-depth Review on the Prevention and Correction of Macroeconomic Imbalances (European Semester).” Retrieved from: http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_croatia_en.pdf

Eurostat, 2018a

Eurostat, 2018b “Early leavers from education and training by sex % of population aged 18 to 24.” Retrieved from: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=sdg_04_10

Eurostat, 2018c. “Gross domestic expenditure on R&D (GERD),” Code: t2020_20, 2018

Eurostat, 2018d. “Smarter, greener, more inclusive? Indicators to support the Europe 2020 Strategy.” Retrieved from: https://ec.europa.eu/eurostat/documents/3217494/9087772/KS-02-18-728-EN-N.pdf/3f01e3c4-1c01-4036-bd6a-814dec66c58c

File, J., T. Farnell, K. Doolan, D. Lesjak, and N. Šćukanec, 2013. “Higher Education Funding and the Social Dimension in Croatia: Analysis and Policy Guidelines.” Zagreb: Institute for the Development of Education.

Government of the Republic of Croatia [Government], 2018a. “Nacionalni program reformi 2018” [National Reform Program 2018].

Government of the Republic of Croatia [Government], 2018b. “Izvješće o provedbi nacionalnog programa reformi 2017. za razdoblje studeni 2017.-travanj 2018.” Zagreb: Government of the Republic of Croatia.

Government of the Republic of Croatia, 2018. National Reform Programme 2018

Government of Croatia, n.d. “VET System Development Program 2016-2020.”

Jakubowski, M., H. Patrinos, E. Porta, and J. Wiśniewski, 2010. “The Impact of the 1999 Education Reform in Poland.” World Bank Policy Research Working Paper 5263.

Letica, J., N. Buic, and N. Vakanjac, 2014. “Croatia: VET in Europe – Country Report.” CEDEFOP. REFERNET.

Ministry of Economy, n.d.(a) “Smart Specialization Strategy of the Republic of Croatia for the period 2016 – 2020” and “Action Plan for implementation of the Smart Specialization Strategy of the Republic of Croatia for the period 2016 – 2020.” Retrieved from: http://www.obzor2020.hr/userfiles/obzor2020/pdfs/Strategija_pametne_specijalizacije_RH_2016_2020.pdf

Ministry of Economy, n.d.(b) “Strategy for Fostering Innovation of the Republic of Croatia 2014-2020.” Retrieved from: https://www.mingo.hr/public/documents/Strategija_poticanja_inovacija_18_12_14.pdf

Ministry of Education, Science and Sport of the Republic of Slovenia, 2017. The EDUCATION SYSTEM in the Republic of Slovenia 2016/2017. Retrieved from: http://203.gvs.arnes.si/wordpress/wp-content/uploads/2017/03/The-Education-System-in-the-Republic-of-Slovenia-2016-17.pdf

Ministry of Science and Education, n.d. “Strategy of Education, Science and Technology (SEST).” Retrived from: http://novebojeznanja.hr/UserDocsImages/datoteke/KB_web.pdf

Montenegro, C. and H. Patrinos, 2014. “Comparable Estimates of Returns to Schooling Around the World.” World Bank Policy Research Working Paper 7020. Retrieved from: http://documents.worldbank.org/curated/en/830831468147839247/pdf/WPS7020.pdf

MOZVAG, n.d. Directory of Study Programs. Indicator: Field of study and subject (accessed on October 6, 2018)

National Council for Human Potential Development [NCHPD], 2015. “Preporuke o primjeni Hrvatskoga kvalifikacijskog okvira u području visokog obrazovanja” [Recommendations for implementation of Croatian Qualifications Framework in Higher Education]. Zagreb: NCHPD.

OECD, 2018. “Education at a Glance 2018: OECD Indicators.” Paris: OECD Publishing.

OECD, 2017. “Starting Strong 2017 – Key OECD Indicators on Early Childhood Education and Care.” Retrieved from https://read.oecd-ilibrary.org/education/starting-strong-2017_9789264276116-en#page148

OECD, n.d. “Croatia Student Performance (PISA 2015). In *Education GPS*. Retrieved from: http://gpseducation.oecd.org/CountryProfile?plotter=h5&primaryCountry=HRV&treshold=10&topic=PI

Operational Programme Under the Investment for Growth and Jobs Goal

Peeters, J, 2018. “Importance of Investing in Pre-Primary Education.” For Every Child a Kindergarten National Conference. UNICEF, Zagreb.

Psacharopoulos, G. and H. Patrinos, 2018. “Returns to Investment in Education: a Decennial Review of the Global Literature.” World Bank Policy Research Working Paper 8402. Retrieved from: https://openknowledge.worldbank.org/bitstream/handle/10986/29672/WPS8402.pdf?sequence=1&isAllowed=y

Račić, D., J. Švarc, and G. Testa, 2018. “RIO Country Report 2017: Croatia,” EUR 29155 EN, Publications Office of the European Union, Luxembourg

Schweinhart, Montie, Xiang, Barnett, Belfield and Nores, 2005. “The High/Scope Perry Preschool Study Through Age 40.”

Šćukanec, N., Sinković, M., Bilić, R., Doolan, K and Cvitan, M., 2016. “Socijalni i ekonomski uvjeti studentskog života u Hrvatskoj: nacionalno izvješće istraživanja EUROSTUDENT V za Hrvatsku za 2014.” [Social and Economic Conditions of Student Life in Croatia: National Report of EUROSTUDENT V survey for Croatia for 2014]. Zagreb: Ministry of Science, Education and Sports.

SDG Fund, n.d. “Sustainable Development Goals - Goal 4: Quality Education.” United Nations Development Program. Accessed on October 2018: http://www.sdgfund.org/goal-4-quality-education, accessed October 2018

Sondergaard, L., M. Murthi, D. Abu-Ghaida, C. Bodewig, and J. Rutkowski, 2012. “Skills, Not Just Diplomas : Managing Education for Results in Eastern Europe and Central Asia.” World Bank.

Strategija obrazovanja, znanosti i tehnologije, 2014. Retrieved from: https://vlada.gov.hr/UserDocsImages//2016/Glavno%20tajni%C5%A1tvo/Materijali%20za%20istaknuto/2014/Strategija%20obrazovanja%20znanosti%20i%20tehnologije//1.%20Rani%20pred%C5%A1kolski,%20osnovno%C5%A1kolski%20i%20srednjo%C5%A1kolski%20odgoj%20i%20obrazovanje.pdf

Subrahmanyam, G., 2014. “Vocational education: why the Finns do it best.” The Guardian, January 15, 2014. Retrieved from: https://www.theguardian.com/global-development-professionals-network/2014/jan/15/youth-unemployment-vocational-training-finland

UNESCO Institute for Statistics, n.d. Accessed October 2018: http://data.uis.unesco.org/#

University of Zadar, 2017. “Strengthening the Capacities of the Chambers and Partners to Help SMEs to Engage in Apprenticeship.” Cap4App project. Erasmus+. Retrieved from: http://www.dualnoobrazovanje.hr/UserDocsImages/Cap4App%20dokumenti/deliverables/4.4.%20Programme%20for%20Mentors.pdf

Urban, Mathias, 2009. “Early Childhood Education in Europe: Achievements, Challenges and Possibilities.” Education International. Retrieved from: https://download.ei-ie.org/Docs/WebDepot/2009_EarlyChildhoodEducationInEurope_en.pdf

Wes, Marina and C. Bodewig, 2016. “Poland’s Education System: Leading in Europe.” Originally posted in Rzeczpospolita. Retrieved from: http://www.worldbank.org/en/news/opinion/2016/01/22/polands-education-system-leading-in-europe

World Bank, 2019. “Investing in Opportunities for All: Croatia Country Gender Assessment.” Retrieved from http://pubdocs.worldbank.org/en/695541553252905811/WB-Croatia-gender-equality-22032019.pdf

World Bank, 2018a. “Europe Skills for Competitiveness: Leveraging Skills for Competitiveness in Europe.” Education Global Practice, Europe and Central Asia Region.

World Bank, 2018b. “Human Capital Index: Country Brief – Croatia.” Retrieved from http://databank.worldbank.org/data/download/hci/HCI_2pager_HRV.pdf

World Bank, 2018c. “Human Capital Index and Components, 2018.” Retrieved from: http://www.worldbank.org/en/data/interactive/2018/10/18/human-capital-index-and-components-2018

World Bank, 2018d. “Learning to Realize Education’s Promise.” World Development Report 2018.

World Bank, 2018e. “The Republic of Croatia Systematic Country Diagnostic.” Retrieved from: http://documents.worldbank.org/curated/en/452231526559636808/pdf/Croatia-SCD-clean-05142018.pdf

World Bank, 2018f. “World Bank support to Higher Education in Latvia.” Focus on Performance. Retrieved from: http://www.worldbank.org/en/country/eu/publication/world-bank-support-to-higher-education-in-latvia

World Bank, 2012. “Jobs.” World Development Report 2013. Retrieved from: https://siteresources.worldbank.org/EXTNWDR2013/Resources/8258024-1320950747192/8260293-1322665883147/WDR_2013_Report.pdf

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