



1. Project Data

Project ID

P127308

Project Name

Science and Technology II

Country

Croatia

Practice Area(Lead)

Finance, Competitiveness and Innovation

L/C/TF Number(s)

IBRD-82580

Closing Date (Original)

30-Jun-2017

Total Project Cost (USD)

23,087,463.89

Bank Approval Date

26-Apr-2013

Closing Date (Actual)

30-Apr-2020

IBRD/IDA (USD)
Grants (USD)

Original Commitment

26,240,000.00

0.00

Revised Commitment

25,620,862.69

0.00

Actual

23,087,463.89

0.00

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2. Project Objectives and Components

a. Objectives

According to the Loan Agreement (page 5), the project development objective (PDO) of the Republic of Croatia Second Science and Technology Project was "to help Croatia absorb European Union (EU) funds in the research and innovation sector by capacitating selected public sector organizations and stimulating the demand for those funds from the business and scientific communities."

A member of the EU beginning in 2013, Croatia is eligible to apply to, and receive funding from, the EU from the latter's facilities in the research and innovation sector including the European Regional Development Fund



and the European Social Fund, both parts of the European structural and investment funds, and the EU Horizon 2020 Framework Programme for Research and Innovation, which replaces the Seventh EU Framework Program for Research and Innovation

This project followed the Republic of Croatia (First) Science and Technology Project, 2005-2011, financed by the World Bank, which aimed to enable research and development institutions to commercialize research outputs, and to increase the ability of enterprises, particularly small and medium enterprises, to invest in research and development activities. Both projects were stand-alone operations.

For purpose of assessing the efficacy of the project in Section 4, the two parts of the PDO will be addressed together because the public sector organizations where capacity building would take place were also involved in stimulating demand for funding research and innovation.

b. Were the project objectives/key associated outcome targets revised during implementation?
No

c. Will a split evaluation be undertaken?
No

d. Components

Capacity Building for the Absorption of the EU Funds (EUR 7.5 million in IBRD financing estimated at appraisal, EUR 6.2 million actual at closing) supported the provision of: (a) general technical assistance and training to the Republic of Croatia, the Ministry of Science and Education (MOSE), the Croatian Agency for Small and Medium Enterprises, Innovations, and Investments (HAMAG-BICRO), the Unity through Knowledge Fund and the Croatian Science Foundation (UKF/CSF), and other selected public sector organizations in the research and innovation sector to help improve their capacity to qualify for and manage EU funds; (b) technical assistance for the preparation of project applications; and (c) project management support.

Research and Innovation Programs (EUR 12.2 million in IBRD financing and EUR 4 million in borrower contribution estimated at appraisal, EUR 13.4 million actual at closing) financed programs previously supported by the First Science and Technology Project to maintain and increase the pool of small and medium enterprises (SMEs) and researchers that could apply to future EU-funded grant schemes, specifically: (a) the HAMAG-BICRO programs --- the Proof of Concept Program, the Development Program for Knowledge-Based Companies, and the Program Za Istraživanje i Razvo; and (b) the MOSE and UKF/CSF programs --- Research Cooperability, Young Researchers and Professionals Program, Connectivity Program, Technology Transfer Office Support Program 20, and other absorption capacity programs related to EU scientific framework initiatives.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The project was estimated to cost Euro (EUR) 24 million at appraisal.

Project Financing: The project was financed with a loan of EUR 20 million (US\$26.4 million equivalent) from the International Bank for Reconstruction and Development. The loan amount of EUR 19.7 million



(US\$23.1 million equivalent) was disbursed (98.3 percent of the loan in EUR terms). (The exchange rate was EUR 1.00 = US\$1.312 at appraisal and EUR 1.00 = US\$1.0855 at closing).

Borrower Contribution: The borrower financial contribution was estimated at EUR 4 million (US\$9.4 million equivalent) at appraisal.

Dates: The project was approved on April 26, 2013, became effective on July 31, 2013, and closed on April 30, 2020, roughly three years after the original closing date of June 30, 2017.

Restructuring: The project was restructured five times: (a) on February 11, 2015, with US\$7.16 million (27.1 percent of the original funding) disbursed, to change the results framework, the financing plan, the reallocation between disbursement categories, the implementing agency, and the project institutional arrangements; (b) on April 4, 2017, with US\$16.02 million (60.7 percent of the original funding) disbursed, to change the results framework, the financing plan, the reallocation between disbursement categories, the implementation schedule, and the loan closing date; (c) October 1, 2018, with US\$20.35 million (77.1 million of the original funding) disbursed, to change the results framework, the project components and cost, the financing plan, the reallocation between disbursement categories, the implementation schedule, and the loan closing date; (d) on June 25, 2019, with US\$22.64 million (85.8 million of the original funding) disbursed, to change the allocation between disbursement categories; and (e) on December 24, 2019, with US\$23.58 (89.3 percent of the original funding) disbursed, to change the loan closing date.

None of these restructuring changed the level of ambition of the project and consequently a split evaluation of outcomes is not indicated.

3. Relevance of Objectives

Rationale

The project development objective was relevant to the development priorities of Croatia at appraisal and closing.

- According to *Croatia Policy Notes: A Strategy for Smart, Sustainable and Inclusive Growth*, prepared by the Bank in 2012 ahead of Croatia's accession to the EU in 2013, research and innovation could yield benefits to the Croatian economy. Spending by the business sector on research and development (R&D) remained low, despite generous tax breaks (subsidies of about US\$0.35 for every US\$1 of R&D spending), amounting to about Euro 10 per capita, compared, for instance, to about Euro 130 per capita by Slovenia. Meanwhile, R&D by the public sector suffered from limited cooperation between public research organizations and private firms and poor rates of commercialization of government-funded technologies. The contribution of innovation to the productivity of the average firm in Croatia was about 30 percent less than in a peer group of eight EU countries. Yet, simulations indicated that increasing aggregate R&D spending to 3 percent of GDP, including to about 2 percent of GDP by the private sector, could raise GDP by about 5.8 percent and exports by about 13 percent above the baseline by 2025. Moreover, greater and better innovation would help the Croatian firms to close the productivity gap with their competitors in the EU.



- The country's ongoing fiscal consolidation program at the time of EU accession limited the availability of public funding for additional R&D spending. Alternatively, the country's EU accession offered the prospect that it could benefit from the EU's cohesion policy, which aimed to reduce disparities in the levels of development across the EU, and from the EU's five European structural and investment funds, which aimed to invest in job creation and a sustainable environment across the EU in five focus areas: research and innovation, digital technologies, supporting the low-carbon economy, sustainable management of natural resources, and small businesses. The project objective was aligned with the foregoing strategy to avail of EU funds to advance the country's research and innovation agenda.
- The *National Reform Programme 2020*, adopted by the government in April 2020 and part of the EU European Semester Framework which defines economic policy priorities and measures to be implemented by member states over the next 12-18 months, continued to place an emphasis on "strengthening the national innovation system and innovation potential of the economy" and "strengthening human resources as well as the science and technology system by aligning it with the economy." The project objective remained consistent with these national economic policy priorities.

The project development objective was aligned with the Bank Group strategy in Croatia at appraisal and closing.

- The *Country Partnership Strategy for the Republic of Croatia for FY14-FY18* pledged Bank Group support in three thematic areas: (a) public finance – supporting fiscal consolidation to speed up sustained growth, with an emphasis on expenditure rationalization to ensure fiscal sustainability over the medium-term; (b) innovation and trade competitiveness – improving competitiveness, focused on structural, institutional, and governance reforms, to enable Croatia to catch up with its EU peers; and (c) EU membership – helping Croatia maximize the economic benefits of becoming an EU member state by increasing the country's capacity to implement harmonized policies, to absorb the large increase in EU funds, and help use these resources effectively. The project objective was aligned with the Country Partnership Strategy's second and third thematic areas. The project would help Croatia realize the benefits of accession to the EU, convergence to the wealth levels in developed countries, and private sector-led growth through more and better R&D and innovation.
- The *Country Partnership Framework for the Republic of Croatia for the Period FY19-FY24* committed Bank Group support in three focus areas: (a) enhancing public sector performance and institutions; (b) preserving and leveraging natural capital to ensure low carbon growth; and (c) strengthening market institutions to enable a dynamic enterprise sector. The project objective was also aligned with the Country Partnership Framework's third focus area, specifically with the objective "to promote entrepreneurship, competition, and innovation." The project and its predecessor First Science and Technology Project were designed to help address binding constraints in research and innovation including the lack of coordination between government institutions, academia and private sector; the presence of barriers to science-industry collaboration; and weaknesses in the governance of the innovation ecosystem.

Rating
High



4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To help Croatia absorb EU funds in the research and innovation sector by capacitating selected public sector organizations and stimulating the demand for those funds from the business and scientific communities.

Rationale

Theory of Change. The ICR (page 9) offered the following theory of change, which was not explicitly described in the Project Appraisal Document but could nonetheless be inferred from the project activities and the results framework. The provision to public agencies of general technical assistance in qualifying for EU funds and special technical assistance in the preparation of applications for project funding would raise the number of agency staff knowledgeable about EU funding procedures, allowing the agencies to deliver information to R&D institutions and beneficiaries, and enabling the country to produce three R&D policy documents required by the EU for Croatia to qualify for financing from European structural and investments funds and to submit project proposals to these EU funds. The provision of project funds to implement R&D and innovation programs earlier supported under the First Science and Technology Project would increase the number projects assisted by the agencies, raise the value of financing provided by the agencies' own resources and the beneficiaries' own investment, increase the number the intellectual property rights applications, increase the number of collaborative ventures between domestic and foreign research institutes and between homeland and diaspora researchers, increase the number of commercialization agreements between research and industry, and further build up the pipeline of research and innovation proposals for EU financing. Assuming that the policy framework was maintained and institutional capacity was strengthened, Croatia should be able to productively use the EU funds, thereby boosting economic growth through R&D and innovation and progressing toward eventual economic convergence with the developed EU states.

Outputs. The project met two output targets for the objective to help Croatia absorb EU funds in the research and innovation sector by capacitating selected public sector organizations.

- The number staff in the Ministry of Science and Education and its organizations and R&D institutions (HAMAG-BICRO, UKF/CSF, Technology Transfer Office) trained on EU procedures for project preparation and implementation increased from eight in the baseline to 185 by the project closing date, exceeding the target of 30. According to the ICR (page 38), the training enhanced the capacity of the research and innovation stakeholders to use and manage EU funds: (a) HAMAG-BICRO served as an intermediary for several EU funds programs, most notably the IRI grant schemes; (b) many HAMAG-BICRO project beneficiaries were recipients of EU-funded IRI grants; (c) the UKF helped prepare new research program for financing by the European Social Fund (managed by the CSF) and steered beneficiaries to use both the European structural and investment funds and the highly competitive central European funds for R&D; and (d) Technology Transfer Office acted as a central support unit to researchers preparing applications for the IRI infrastructure program and managing the EU-funded Centers of Excellence (which included 10 Centers of Excellence and 35 scientific institutions throughout Croatia).



- The number of workshops and conferences delivered to R&D institutions and beneficiaries reached four, exceeding the target of three.

The project met nine of ten output targets for the objective to help Croatia absorb EU funds in the research and innovation sector by stimulating the demand for EU funds from the business and scientific communities.

- The total number of projects financed by HAMAG-BICRO increased from 44 in the baseline to 250 by the project closing date, exceeding the target of 188. The contracted projects included: (a) 40 projects under the Proof of Concept Program Call No. 4; (b) 49 projects under the Proof of Concept Program Call No. 5; (c) 62 projects under the Proof of Concept Program Call No. 6; (d) 54 projects under the Proof of Concept Program Call No. 7; (e) nine projects under the Development Program for Knowledge-Based Companies; (f) 21 projects under the Program Za Istraživanje i Razvoj; and (g) 15 projects under the Technology Transfer Office Support Program. According to the ICR (page 40), the government continued, beyond this operation, to finance the Proof of Concept Program for the private sector and contracted for 83 projects for the Proof of Concept Program Call No. 8, worth EUR 4.4 million; the projects have been under implementation since December 2019.
- The total value of projects financed by HAMAG-BICRO increased from EUR 2.5 million in the baseline to EUR 23.4 million by the project closing date, exceeding the target of EUR 17.8 million. In addition to the amount contracted by UKF/CSF, this indicator includes the amount co-funded by final project beneficiaries. Unlike the PDO-level indicator of almost identical wording, this results indicator includes funds from the project and the co-funds mobilized by the project beneficiaries themselves. These amounts are significant --- 40 percent additional funds, amounting to EUR 1.9 million, were invested by national and foreign beneficiary institutions and the private sector in 59 UKF sub-projects.
- The number of products, processes, and designs developed in projects within HAMAG-BICRO for which intellectual property rights will be sought reached 82 by the project closing date, exceeding the target of 72. These consisted of: (a) four under the Development Program for Knowledge-Based Companies; (b) eight under the Program Za Istraživanje i Razvoj; (c) 31 under the Proof of Concept Program Call No. 4 and Call No. 5; (d) 18 under the Proof of Concept Program Call No. 6; (e) 10 under the Proof of Concept Program Call No. 7; and (f) eight under the Technology Transfer Office Support Program.
- The number of researchers from the public sector included in projects under the Development Program for Knowledge-Based Companies and the Sponsored Research Development Program within HAMAG-BICRO increased from four in the baseline to 88 by the project closing date, exceeding the target of 80.
- The number of foreign research institutions collaborating in UKF/CSF projects reached 73, exceeding the target of 49.
- The total value of projects committed to and financed by the UKF/CSF was EUR 6.7 million, exceeding the target of EUR 4.6 million. In addition to the amount contracted by UKF/CSF, this indicator includes the amount co-funded by final project beneficiaries. Unlike the PDO-level indicator of almost identical wording, this results indicator includes funds from the project and the co-funds mobilized by the project beneficiaries themselves. These amounts were significant --- 40 percent additional funds, amounting to EUR 1.9 million, were invested by national and foreign beneficiary institutions and the private sector in 59 UKF/CSF sub-projects.
- The number of collaboration projects between diaspora and homeland researchers at the UKF/CSF was 38 by the project closing date, exceeding the target of 32.



- The number of commercialization and collaboration agreements signed with industry reached 11 by the project closing date, exceeding the target of four. There were three collaboration agreements and eight licenses under the Technology Transfer Office Support Program.
- The value of collaboration and commercialization agreements signed with industry was EUR 35.4 million by the project closing date, failing to achieve the target of EUR 200 million. This indicator was designed based on the experience of the First Science and Technology Project, which predominantly financed programs supporting the later stages of innovation. In contrast, this project placed a greater focus on the early stages of the innovation chain (Proof of Concept Program), where the risks are higher and market failures more evident. In addition, the allocation for the program of technology transfer was reduced during implementation.
- The share of UKF grants submitted by female applicants rose from 20 percent in the baseline to 42 percent by the project closing date, close to the target of 42.25 percent.

In addition, the project recorded the following three gender-related outputs.

- The share of HAMAG-BICRO projects submitted by female applicants rose from 0 percent in the baseline to 25.2 percent by the project closing date. No target was set for this output indicator.
- The share of UKF/CSF grants assigned to female researchers rose from 10 percent in the baseline to 43.7 percent by the project closing date. No target was set for this output indicator.
- The share of HAMAG-BICRO projects assigned to female applicants rose from 0 percent in the baseline to 19.3 percent by the project closing date. No target was set for this output indicator.

Outcomes. The project achieved two outcome targets for the objective to help Croatia absorb EU funds in the research and innovation sector by "capacitating selected public sector organizations".

- The set of innovation and research and development (R&D) policy documents required for absorption of the EU funds were prepared as planned. The target was to meet the *ex-ante* conditionality for the use of EU funds for R&D. By the project closing date: (a) the *Strategy on Education, Science and Technology* was adopted by the Parliament in October 2014; (b) the *Smart Specialization Strategy* was approved by the European Commission in March 2016; and (c) the *National Research Infrastructure Roadmap* was updated and adopted following the approval of the *Smart Specialization Strategy*.
- Six project proposals were prepared for submission to the EU funds, meeting the target. One project was completed and five are in various stages of implementation: (a) the *R&D Grant Scheme for Strengthening the Capacities for Research, Development, and Innovation* (EUR 12.8 million) was developed by MOSE in 2012 and served as background and reference for a scheme implemented under the 2007-13 European Regional Development Fund --- the grant supported R&D and innovations through technology transfer and commercialization; (b) the *Cooperation Program with Croatian Scientists in Diaspora Research Cooperability* (EUR 5.6 million) was developed by UKF/CSF and designed using the experience of the Research Cooperability Program and was funded by the European Social Fund --- the grant scheme (grant funds were awarded to 23 sub-projects) promoted the cooperation of Croatian science with the Croatian diaspora; (c) the *Open Scientific Infrastructural Platforms for Innovative Applications in Economy and Society* (EUR 72 million) was developed by the Ruđer Bošković Institute --- the project will expand the Institute's intellectual property, capital equipment, and know-how, while boosting cooperation between science and business sector; (d) the *Centre of Competence for Translational Medicine* (EUR57 million) was developed by the Children's Hospital Srebrnjak --- the project will develop a medical center linking



clinical practice and research, develop personalized therapy and innovative drugs, and introduce new technologies in chronic diseases; (e) the *Croatian Scientific and Educational Cloud* (EUR 25.9 million) was developed by University Computing Centre at the University of Zagreb --- the project will support the main component of the national e-infrastructure of the science and education system, ensuring efficient and sustainable computer and data storage resources and services to the academic community; and (f) the *Centre for Advanced Laser Techniques* (EUR16.2 million) was developed by the Institute of Physics --- the project will upgrade existing, and develop completely new, infrastructure based on advanced laser techniques.

These were substantial capacity building efforts.

The project met three outcome targets for the objective to help Croatia absorb EU funds in the research and innovation sector by "stimulating the demand for EU funds from the business and scientific communities".

- The total value of projects in the pipeline for funding through the grant scheme managed by HAMAG-BICRO increased from EUR 3.6 million in the baseline (2012) to EUR 45.4 million by the project closing date, close to the target of EUR 46 million. Covering 250 sub-projects of HAMAG-BICRO and 59 sub-projects supported by UKF/CSF, the amount includes only the value covered by loan proceeds and national counterpart funding, and does not include funds invested by the beneficiaries themselves.
- The total value of projects in the pipeline for funding by EU funds originated from UKF/CSF projects increased from EUR 1.6 million in the baseline to EUR 66.3 million, exceeding the target of EUR 24 million. Projects were submitted to: (a) the Horizon 2020 and other European central programs --- notably the European Research Council, Marie Curie Fund, Future and Emerging Technologies, Erasmus, FLAG-ERA Consortium --- valued at EUR 44.3 million; (b) the INTERREG programs of the European Territorial Cooperation, valued at EUR 5.8 million; and (c) the Operational Programme for Competitiveness and Cohesion 2014-2020 and Operational Programme for Effective Human Resources 2014-2020 under the European structural and investment funds, valued at EUR 16.2 million. According to the ICR, EUR 22.7 million of funding had been awarded and the associated projects were in implementation by the project closing date.

The project stimulated a substantial demand for research and innovation funds.

Rating

Substantial

OVERALL EFFICACY

Rationale

The project substantially achieved the capacity building and the demand stimulation elements of the PDO. It met 11 of 12 output targets and all five outcome targets for the objective to help Croatia absorb EU funds in



the research and innovation sector by capacitating selected public sector organizations and stimulated the demand for those funds from the business and scientific communities.

Overall Efficacy Rating

Substantial

5. Efficiency

Economic Efficiency - Economic Rate of Return. The Project Appraisal Document (pages 10-11) did not compute an economic rate of return for the project, but stated that according to one study, the "social rate of return" of R&D investment in Croatia was about 73 percent. The ICR (pages 17-18 and 54-67) presents a more systematic analysis of the economic return of the project, based on the work of the Institute of Economics - Zagreb: (a) based on the four large R&D infrastructure projects, the economic rate of return of the first component of the project (Capacity Building) over the period 2013-32 was 24.3 percent --- the benefits consisted of investments, new scientific publications, human capital formation, social value of learning-by-doing, and social capital development; (b) the economic rate of return for the second component (Research and Innovation) was not calculated because it was regarded as a technical assistance and hence had no measurable economic benefits; but, (c) the overall economic rate of return for the project was computed as 61.4 percent based on benefits such as private investment, externalities and social returns.

Financial Efficiency - Financial Rate of Return. The Project Appraisal Document and the ICR both contend that the project was designed to mobilize additional investments for programs supported by the operation. On this basis, both documents compute a separate financial internal rate of return for the project based on the amount of EU structural and investment funds that the programs were, respectively, estimated to or able to mobilize. The Project Appraisal Document (page 11) projected that the operation would mobilize EUR 205-255 million of EU structural and investment funds and estimated the financial internal rate of return of the project at 100 percent. The ICR (pages 55 and 60) reported that the operation actually generated EUR 301.4 million of additional financing (EUR 171.4 million for four infrastructure projects approved for EU financing and EUR 130.3 million mobilized separately by HAMAG-BICRO and UKF/CSF beneficiaries). The ICR (page 60) summarized the financial internal rate of return of the project calculated by the Institute of Economics - Zagreb as follows: (a) the internal rate of the first component of the project (Capacity Building) was not shown separately; (b) the internal rate of return of the second component (Research and Innovation) was 23.3 percent, using only the EU structural funds mobilized by the component; and (c) the overall internal rate of return for project was 57.4 percent, using EU structural funds mobilized by the first and second components and national contributions mobilized by the first component, or 106.8 percent, using EU structural funds mobilized by the first and second components but not national contributions mobilized by the first component.

Operational Efficiency. The project financing was fully disbursed. Project administrative costs were kept at 11 percent of total project cost, lower than the originally estimated 12 percent of total project cost. The project was restructured five times and closed three years later than originally scheduled.

Efficiency Rating



Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal		0	0 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	61.40	100.00 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The project development objective was highly relevant to the development priorities of the government in research and development and innovation and also relevant to the country partnership strategy of the Bank Group in Croatia. The degree of achievement of the objective to help Croatia absorb EU funds in the research and innovation sector by capacitating selected public sector organizations and stimulating the demand for those funds from the business and scientific communities is rated as substantial. The project met 11 of 12 output targets and all five outcome targets. The efficiency of the project is rated as substantial. The project posted high estimated economic and financial rates of return, the latter based on additionality criteria. Implementation of the project though was delayed, primarily because of unplanned changes to the institutional structure governing the research and innovation sector, and closing lagged three years behind schedule. This review concluded that the project's objectives were achieved with minor shortcomings in relevance, efficacy and efficiency and its overall outcome is therefore rated as satisfactory.

a. Outcome Rating

Satisfactory

7. Risk to Development Outcome

The risks to the sustainability of the project's development outcome appear to be moderate.

Political risk. The change in government in 2016 and the changes in leadership at the MOSE (there were five Ministers over the duration of this project) led, in many cases, to changes in the post of Project Coordinator over 2013-2020, which adversely affected the pace of project implementation, according to the government's completion report, enclosed in the ICR (page 71). Nonetheless, the project was completed in its entirety, and it appears that political commitment to the objective of strengthening the government's and the private sector's capacity to mobilize EU and other resources for research and innovation remains strong and consistent. The country's 2020-24 program pledges to use country's EU funds (Croatia was allocated EUR 22 billion under the long-term EU Budget for 2021-27) to boost competitiveness based on new



technologies.

Policy Risk. The adoption by Croatia, under this project, of three key policy and strategy documents --- the *Strategy on Education, Science and Technology*, the *Smart Specialization Strategy*, and the *National Research Infrastructure Roadmap* --- aligns the country's research and innovation programs to the strategies of the EU for supporting innovation in member states. Reinforcing this policy commitment moving forward, *Competitive Croatia*, part of the country's 2020-24 program, aims to boost investments for entrepreneurship, innovation, and new products to HRK 5 billion and increase R&D expenditures from the current one percent of GDP to 2.5 percent.

Project Pipeline Risk. A strong pipeline of R&D projects built over the past five years will likely sustain the project objective in the near- to medium-term, albeit some systemic issues remain to be addressed. The project brought capital infrastructure upgrades and strengthened the related human resources.

Institutional Risk. Decisions on the restructuring of the public research organizations of the country to make the national innovation system more efficient and performance-based remain pending. There have been some setbacks in the institutional framework for the national innovation system, according to the ICR (page 30). HAMAG-BICRO had not been able to scale up several programs, with the exception of the Proof of Concept Private Program, because of poor leadership. The organization had also lost staff. The CSF must continue to review its process for the award of funds to adhere to strict merit-based principles.

Economic Risk. The government's ability to sustain project outcomes depends in part on the health of public finances and of the overall economy. According to the *IMF 2019 Article IV Consultation with the Republic of Croatia*, the economy had become stronger over the last five years because of strong budget management by the government and skillful policies by the central bank. However, fiscal performance has recently become encumbered by numerous spending demands, and for, this reason, the government has been forced to withhold planned tax reductions and shift spending priorities towards more and better public investment. The government will need to focus on areas where "hard" physical infrastructure needs improvement, while also upgrading "soft" technological infrastructure to position the economy attractively in the next generation of European value chains in information and communications technology and business services.

8. Assessment of Bank Performance

a. Quality-at-Entry

The Bank conducted the necessary due diligence during project design. The Bank carried out policy analyses and technical assessments of options to support the Croatian research and innovation system. It drew on the experience gained from the First Science and Technology Project to design the project components, choosing project-level interventions for this investment operation while keeping policy reforms under the purview of the proposed Second Economic Recovery Development Policy Loan. The design was underpinned by analytic work, including *Estimating the Impact of R&D and Innovation in Croatia* (Seker, 2011), *Croatia Policy Notes: A Strategy for Smart, Sustainable and Inclusive Growth* (World Bank, 2012), and *Main Findings of the Comprehensive Monitoring Report on Croatia's State of Preparedness for EU Membership* (European Commission, 2012). The Bank supported project



design activities with an advance from the Project Preparation Facility, the revolving fund that finances the preparation and limited implementation activities of investment projects. It also conducted intensive consultations with stakeholders, providing them with adequate opportunity and sufficient time to "own the agenda", according to the ICR (page 28).

The Bank addressed "unknowns" about the EU funds at the time of project appraisal. It was feared that the R&D approach advanced by the project might not be compatible with the rules for the use of EU funds. Specifically, while the project advocated a "nurturing" approach to innovation by SMEs, including through the extension by sub-project selection teams of hands-on assistance in the preparation of candidate firms' business plans, the EU required a separation of duties between sub-project selection teams and sub-project assistance teams. The Bank addressed this issue by: (a) engaging the government in extensive discussions about R&D sector interventions; (b) contributing to the development of the government's Smart Specialization Strategy; and (c) designing the project broadly to allow for adjustments in project activities as information about the EU funds became available.

The Bank considered the availability of counterpart funds to be the principal operational risk in the use by Croatia of EU funds, although it judged the overall implementation risk of the project to be moderate. The use by member states of EU funds required counterpart budgetary contributions for project preparation, pre-financing (EU funds were drawn down with a lag), and co-financing, apart from direct contribution to the EU budget itself. Croatia had historically provided adequate budgetary resources for Bank projects even under constrained conditions, as illustrated in the First Science and Technology Project. Yet, the risk remained because of recent tightened fiscal policy. To mitigate the risk, the Bank recommended the careful programming of government resources. The government was cognizant of the issue and had collaborated with the Bank in developing a sound fiscal consolidation strategy, supported by policy loans (the Economic Recovery Development Policy Loan) and technical assistance (the Public Finance Review).

Quality-at-Entry Rating Satisfactory

b. Quality of supervision

The Bank provided intensive supervision of the project. The task team leader, the sector operations staff, and the procurement specialist were based in country, while financial management and task management expertise were available from staff based in neighboring countries. According to the ICR (page 29), the government considered the supervision arrangements helpful, with the task team leader available to the MOSE and project stakeholders on a daily basis. The guidance and expertise provided by task team leader was valuable to the sub-project preparation activities for the large infrastructure projects submitted for EU financing. The experience and learning gained by the management team from previous operations was useful, as was their ability to engage with the EU directly.

The Bank was proactive in identifying project implementation and M&E issues. Many problems were addressed in the five restructuring episodes. The Bank responded correctly to the merger of the Croatian R&D organizations. The merger between the Croatian Agency for Small Entrepreneurship and Investment (HAMAG) and the Business Innovation Croatian Agency (BICRO) into the Croatian Agency for Small and Medium Enterprises, Innovations, and Investments (HAMAG-BICRO) was announced after the project was



negotiated, requiring a project restructuring. The Bank was closely involved in the merger between UKF and CSF into UKF/CSF, insisting on measures to preserve the ability of the agency to generate high-quality scientific work.

The Bank prepared 15 Implementation Status and Results Reports over the seven-year duration of the project, or two a year, the average for Bank investment financing projects.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

The Project Appraisal Document (PAD) (page 19) stated that "M&E activities will be carried out by the PIU. Project implementation will be monitored using quantitative and qualitative indicators. The PIU will start collecting these indicators from the beginning of the project providing periodical benchmarking and presenting the progress of the project towards its objectives in quarterly reports." The Project Implementation Unit at the MOSE, the body responsible for management of the project activities, including coordination, procurement, financial management, disbursement, and reporting, was also responsible for the M&E of the project. The MOSE, HAMAG-BICRO, and UKF/CSF would provide M&E data to the Project Implementation Unit. Because the same institutions participated in the preceding First Science and Technology Project, they were expected to be familiar with the M&E activities of Bank operations.

The PAD (pages 17-21) defined 14 output indicators and six outcome indicators, with baseline values and annual and cumulative targets, to measure the achievement of the project objective, both over time and at project closing. In addition, the Project Appraisal Document defined two gender-related output indicators for purely monitoring purposes (the indicators did not carry any targets). The Restructuring Papers revised the results framework for the project, with the final set of results indicators consisting of 12 output and five outcome indicators. Moreover, the Restructuring Papers maintained three gender-related output indicators for monitoring purposes (the indicators did not carry any targets). According to the ICR (page 26), it was anticipated that some results indicators would need to be changed because the project was prepared in 2012 and the operating environment for the EU funds was not all known at that time, including the institutional framework for the European structural and investment funds.

In addition, the PAD (pages 39-41) expressed an interest in conducting a systematic impact evaluation of the project, considering that it would be difficult to observe the full outcome of the research and innovation interventions within a short period and that it would require a longer time span to assess the quality of the knowledge spillovers created by the project. The impact evaluation would be confined to the research and innovation programs, particularly the commercialization efforts, supported by HAMAG-BICRO and UKF/CSF. As with the First Science and Technology Project, the plan was to conduct surveys of project beneficiaries, with unsuccessful applicants serving as a comparator group, to evaluate the innovation



outcomes of the project. Indicators from the Community Innovation Survey and the Innovation Union Scorecard of the EU Commission would be used for the analysis. The process would build on the ex-post evaluation conducted for the First Science and Technology Project.

b. M&E Implementation

The M&E indicators were tracked and updated on a quarterly basis. The Project Implementation Unit reported the M&E data updates in quarterly progress reports. The Bank also reported the M&E data updates in its Implementation Status and Results Reports prepared after each supervision mission.

An impact evaluation analysis was also conducted. According to the ICR (pages 25-26), the collection of data on innovation proved difficult for various reasons: (a) there were three different approaches to the evaluation based on different profiles of beneficiaries and activities; (b) there were changes in stakeholders and in project management and leadership teams, including as a result of institutional reshuffling; and (c) at some point, the effort lacked a strong ownership. The impact evaluation was eventually completed, however, despite the initial challenges. The evaluation included a survey of beneficiaries and non-beneficiaries, covered all project components and programs, and analyzed the project's efficacy and efficiency. The evaluation provides a wealth of data and findings for future programs, the salient points of which are summarized in an annex to the ICR (pages 54-67).

c. M&E Utilization

The M&E data was used to inform project management and to make necessary adjustments in the project. Since the project was restructured five times and there were frequent changes in the results framework, the M&E data provided useful information.

According to the ICR (page 26), the MOSE is reviewing the findings and lessons learned from the M&E and impact evaluation analysis to inform future programs in research and innovation, regardless of the source of financing. The impact evaluation, in particular, has reportedly increased the awareness among stakeholders of the importance of M&E tools in the programming activities related to the new EU funding cycle, where a greater focus is expected on results rather than on administrative checks. In 2018, the MOSE requested the assistance of the Bank in conducting a systemic review of the country's science, technology and innovation financing system to improve the efficiency and effectiveness of public spending in the sector.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

Environmental Safeguards. The project was classified as an Environmental Assessment Category "B" at appraisal and triggered *OP/BP 4.01 - Environmental Assessment*. An Environmental Management



Framework was prepared for the European Social Fund to guide the implementation of sub-projects, while specific safeguards measures were prescribed in Environmental and Social Management Plans and in the Control List of Materials. According to the ICR (pages 26-27): (a) environmental and occupation, health and safety risks were related mostly to the use of small amounts of hazardous chemicals and volatile gases in laboratories; the generation of small amounts of hazardous and infectious medical, inert, and other types of wastes, and any unethical treatment of animals; (b) however, no large, significant, or irreversible impacts arose during project implementation; (c) the European Social Fund successfully screened out Environmental Assessment Category "A" sub-projects and only supported Category "B" and Category "C" sub-projects; (d) no non-compliance with environmental standards was recorded; (e) supervision of safeguards compliance was carried out regularly and documented in Aide Memoires and back-to-office reports; (f) the safeguards implementation capacity of the UKF was consistently rated high; and (g) however, there were lapses in safeguards management and compliance reporting by HAMAG-BICRO, which dragged the rating for overall safeguards compliance down to moderately satisfactory.

Social Safeguards. The project did not trigger any social safeguards. There was no land acquisition under this project, and no applicants were allowed to participate in the project if they needed to acquire land for their sub-projects. The rehabilitation and reconstruction of existing buildings was permitted for the purpose of conducting experiment or tests, although such activities were also not expected. Works were not funded under the project. With these restrictions, the project did not trigger *OP/BP 4.12 - Involuntary Resettlement*.

b. Fiduciary Compliance

Procurement: The Loan Agreement (pages 11-12) required: (a) compliance with the *Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers* and the *Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers*; and (b) the use of international competitive bidding for the procurement of goods and non-consulting services and quality- and cost-based selection for the procurement of consultant services. Other methods of procurement would have to be specified in a Procurement Plan. Moreover, the Procurement Plan would have to specify contracts requiring prior-review by the Bank; all other contracts would be subject to post-review by the Bank. The ICR (page 27) reports that: (a) there were delays with procurement during project implementation, related to the preparation of large R&D infrastructure projects for EU financing, but the issues were addressed proactively through timebound action plans; (b) posting a procurement specialist in the Croatia country office allowed for direct and regular interaction with the Project Implementation Unit; (c) regular implementation support missions helped with procurement issues; and (d) procurement was rated satisfactory throughout project implementation.

Financial Management: The Loan Agreement (page 10) required the government to maintain a financial management system following the *International Bank for Reconstruction and Development General Conditions for Loans* of 2012, including by preparing and submitting to the Bank quarterly interim financial reports and having the annual (fiscal year) financial statements audited. The ICR did not raise any issues with financial management during project implementation. According to the ICR (page 27): (a) a financial management system (SCALA accounting software) was procured and utilized throughout the project; (b) financial management reports were issued quarterly as were reports for HAMAG-BICRO and UKF/CSF on the project funds used; (c) the quarterly interim unaudited financial reports of the project and of



participating entities were submitted to the Bank for review in the agreed time frame and were considered acceptable and dully disclosed; and (d) financial management was rated moderately satisfactory throughout project implementation, with appropriate control procedures in place and with project in compliance with all financial covenants.

c. Unintended impacts (Positive or Negative)

d. Other

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Satisfactory	
Bank Performance	Satisfactory	Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

12. Lessons

Three lessons are drawn from the ICR (pages 31-32), with some adaptation.

A strong and stable institutional framework for research and innovation is essential to advance a country's R&D and innovation goals. In this project, the merger between HAMAG and BICRO disrupted the ready implementation of the capacity building efforts and research and innovation programs supported by the Bank. The merger was politically motivated and not properly studied, according to the ICR (page 20), as the two agencies served different SMEs with "incompatible objectives." The Bank also strove to preserve the ability of the UKF/CSF to conduct high-quality scientific work following UKF's merger with CSF, according to the ICR (page 20). Croatia received the recommendations of an international panel of experts for the government to reorganize and restructure its 25 public research institutes. The implementation of the recommendations would strengthen the governance of R&D and innovation programs in the country.

Spending by stakeholders of their own in-country resources for research and innovation strengthens the sustainability of R&D and innovation development programs. In this project, Croatia tapped the EU structural and investment funds to finance its research and innovation programs. But, according to the ICR (pages 31-32), the EU resources were more suitable for supporting interventions that were mature and stable, with the EU financing procedures being highly complex and less amenable to initiatives that were novel and experimental, needing flexible funding structures. The use of the government's own budgetary resources would allow for the funding of



newer and more discretionary approaches to R&D and innovation. But more importantly, the use of their own resources provide stakeholders the ability to sustain their R&D and innovation programs in the long run, whether the programs are mature and structured or novel and experimental.

Government staff who are more knowledgeable of research and innovation concepts, processes, and dynamics are able to support R&D and innovation programs more effectively. In this project, the Bank supported capacity building at public agencies to qualify for, and manage, EU funds. While staff at these agencies were trained at, and gained expertise in, the preparation of applications for EU project funding, they were less knowledgeable about, and familiar with, R&D and innovation topics themselves, according to the ICR (page 32). The lack of expert knowledge at the Project Implementation Unit of R&D, coupled with the inexperience at engaging private research institutes and business firms in the innovation ecosystem, slowed the implementation of the project, according to the ICR. Future research and innovation programs could benefit not only from the development of administrative skills at project implementing agencies, but also from the ready availability, either acquired externally or developed in residence, of substantive technical expertise, experience, and aptitude in research and innovation.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR follows the guidelines and presents a good record of the project. The ICR (page 9) articulates the theory of change underlying the project, which was not explicitly formulated in the Project Appraisal Document. The record of achievement in each of the project components is succinctly summarized in the discussion on efficacy (pages 14-16) and fully documented in the annex on efficiency (pages 54-67). In particular, the key performance achievements of the private Proof of Concept Program, the public sector Proof of Concept Program, the UKF/CSF programs, the Development Program for Knowledge-Based Companies, the Program Za Istraživanje i Razvoj, and the Technology Transfer Office Support Program are documented in detail in Annex 4.

The ICR offers a candid assessment of the efficacy of the project objective. While the project achieved 11 of the 12 output targets and all five outcome targets set for the operation, the ICR highlighted the weakened institutional framework for research and innovation in government following the mergers of HAMAG and BICRO and UKF and CSF. In a box on the national innovation system (page 19), the ICR explains that the mergers of the agencies were not well considered and adversely affected the quality of the governance structure and system for research and innovation in the public sector. Moreover, the recommendations of an international panel of experts on the restructuring of 25 public research institutes faced potential political opposition. Overall, the analysis offered by the ICR was cogent. The lessons offered were also useful.

a. Quality of ICR Rating



Substantial