OECD Review of Higher Education in Regional and City Development

State of Paraná, Brazil
Assessment and recommendations

Towards a region that reaps rewards from investment in human capital development and innovation

Brazil enjoys great natural wealth and development potential. In recent years, the country has made progress not only in economic development, but also in education. Despite this progress, educational attainment levels and the R&D intensity remain low. Education plays a key role in the development of Brazil having a population of around 200 million, of which 60% are under 30 years of age. For both equity and competitiveness, improvement of human capital needs to be a priority for the Brazilian government.

With 10.6 million inhabitants, Paraná is one of the most prosperous states of Brazil, representing 5.62% of the country’s total population, 6% of the Brazilian Gross National Product and 6.5% of the national GDP. However, the share of Paraná in Brazil’s GDP has been eroding in recent years. In terms of per capita wealth, it ranks 7th among the 26 Brazilian states, slightly above the national average. Paraná’s economy is export-oriented. It represented 8% of Brazil’s exports in 2008. The state economy relies on industry (40.7%), commerce (27.3%), services (14.4%) and agriculture (17.6%). The Curitiba metropolitan region, with its well functioning urban development strategy, has a high concentration of urban industrial activities, while the rest of Paraná is characterised by a strong agri-business sector. Paraná has big productive firms on one hand and on the other a wide array of small and medium-sized enterprises, which represent the majority of employment. The few leading-edge companies tend to be located in Curitiba and controlled from outside the country. There are few spill-overs from big firms in terms of job creation, but supply chains are
well-developed in the automotive industry and agri-business. In this context, Paraná faces a triple challenge:

- How to strengthen Paraná as an internationally attractive place to live, work, invest and study in the face of growing global competition?
- How to promote new business formation and support the development of the existing industry and SMEs?
- How to address the problems of poverty and inequity by creating opportunities for growth?

**Human capital development in Paraná**

Paraná represents an important concentration of human capital development with a large, diversified and geographically well-distributed higher education sector and a rapidly growing student population with high potential for innovation.

Paraná has a large, diversified, and geographically well-distributed higher education sector. In 2008, there were 178 higher education institutions, of which 22 were public and 156 were private. Half of the total number of institutions and 89.5% of state higher education institutions in the southern region of Brazil are located in Paraná. Since 2009, Paraná has ten public universities – four federal and six state institutions – and five private universities.

The higher education scene is dominated by federal and state universities. The Federal University of Paraná (UFPR) is the oldest university in Brazil, created in 1912, while the Federal Technological University of Paraná (UTFPR), originally a technical training school, gained university status in 2005. In addition to the main campus in Curitiba, the Federal University of Paraná has two other locations: in Paranagua (Universidade do Litoral); and in the interior of the country (Palotina). Total enrolment of the three campuses is around 25,000 with an annual intake of 5,421 students (2009). Federal Technical University of Paraná has a wide territorial spread, with 11 campuses. In 2008-09, it had 16,840 students and 1,393 professors, offering a wide variety of post-graduate, graduate and vocational training courses. In 2009, two new federal universities were established: UNILA, the International University of Latin America (Universidade Internacional de America Latina) in Foz do Iguaçu and the Federal University of Southern Border (UFFS) in Laranjeiras do Sul. The
Federal Government also maintains four technical institutes in Paraná (Curitiba, Paranaguá, Foz de Iguaçu and Londrina), with four more planned to open in 2010.

The student population in Paraná is close to 330,000 (329,741) as compared with 316,496 in 2007, of the approximately 5.5 million students in Brazil. Around one-third of the students were enrolled in public institutions and of those, two-thirds in state institutions. In fact, the most distinguishing feature of higher education in Paraná is the size and importance of the state-owned higher education sector. As elsewhere in Brazil, due to very competitive admission to public universities, the private sector enrolls by far the highest number of students, which is increasing every year. Around 66% of total enrolment is in private institutions, with 52% in for-profit organisations. Between 1991 and 2007, higher education enrolment in Paraná rose by 6.6% per year, exceeding the average population growth and the increase in 15-24 year cohort (0.65%).

A key determinant to equity in access to and success in higher education lies in the quality of primary and secondary education systems. Access to and success in higher education remains a challenge to many students who are disadvantaged due to their socio-economic background and inadequate preparation in primary and secondary education.

The quality of the pre-university education system determines how well students are prepared to take admission tests and how they progress in higher education. In 2008, only 5% of all students in Brazil came from 40% of the poorest households, and almost all went to fee-charging private institutions. Over 90% of the students in public universities came from 40% of the richest households and nearly three-quarters came from the 20% of the richest households. The admission examinations to universities tend to be biased in favour of students from private high schools who have considerable advantage in entering federal and state universities that both offer free tuition.

Improvements in education at the primary and secondary level are necessary to better prepare all students. Taking into account the young age profile of Brazil, public spending on education per student is low at primary and secondary education. Students’ learning outcomes are poor. While students in Paraná achieve above average results in national testing, international comparisons show a considerable gap to be bridged both for
students in Brazil and Paraná, indicating that there is considerable scope for improvement in the quality of teaching.

It is up to school authorities to work towards improving the quality of education in Brazil and Paraná. At the same time, universities and other higher education institutions can and should reach out to local schools to improve the preparation for higher education. Some initiatives are already in place. For example, the Federal University of Paraná has developed the Educational Development Programme (PDE), in partnership with the State Secretary for Education (SEED), to collaborate with teachers from the public education network in Paraná (RIEP). Recently, the Federal Government and federal universities have agreed on having further education schemes for teachers. These initiatives focus on the improvement of teachers’ discipline-based knowledge rather than their pedagogical skills. There is scope for long-term multi-stakeholder collaboration to improve learning outcomes at schools. Successful international examples in this domain include the Access and Success programme at the University of Victoria in Australia and the El Paso Academic Collaborative in El Paso, Texas, which have both achieved measurable success in widening access and improving success rates of low income students.

The rapid increase in higher education enrolment has contributed to high dropout rates, particularly in private institutions. Throughout Brazil, 20.9% [10.5% (public) 24.5% (private)] of all students drop out before completing a degree, in comparison with the OECD average of 29.6%. There are many reasons for educational failure: insufficient preparation of students in primary and secondary education; inadequacies in the university admission systems; quality issues; need to combine work and study; inflexible curricula; and outdated classroom practices. In Paraná, there is limited data on higher education drop-out rates and students’ academic progress both at the state and institutional level.

Concerns of academic failure are not high on the agenda of Paraná’s higher education sector. As a result, there is little academic and social support for students. Financial support has improved over recent years, but more is needed. The Federal Government’s ProUni and Student Financing Programme (FIES) are the main sources of support for needy students, in addition to individual scholarship schemes run by the state and individual universities. ProUni has been in operation since 2005 and is aimed at placing academically qualified low-income students in private higher education institutions. In Paraná, in the first semester of 2009, a total of 9 483 ProUni scholarships were offered to students, of which 5 615 were equivalent to full tuition. In the first semester of 2010, scholarships rose to 14 357 (522 in full tuition), representing over 6% of enrolment in private higher education institutions. The Student Financing Programme (FIES),
initiated in 1999 (replacing the previous loan scheme), provides loans to needy students who are not beneficiaries of ProUni to cover up to 50% of their tuition costs, while students who are beneficiaries of ProUni can receive a loan of up to 25% of their tuition costs. The State of Paraná also has a number of scholarships and research funds that are specifically targeted to needy students.

Despite the wide range of higher education institutions and financial support, access and success in higher education remain a challenge to many students who are disadvantaged due to their low socio-economic background and inadequate preparation in primary and secondary education. The federal government should review the student funding system, along the lines proposed in the previous World Bank review (Salmi, and Fèvre (2009)). The state authorities in Paraná are recommended to review the state-level student aid programmes with a view to easing financial burden on attending higher education and ensuring that all needy students have access to financial aid. The higher education sector is encouraged to develop more relevant academic, social and financial support to ensure success in education.

*The state and federal governments have supported the expansion of higher education through collaborative extension activities as well as new campuses and institutions to reduce the geographical and social barriers to higher education. Notable initiatives include a university extension programme, “University without Borders” and the Federal Government’s REUNI programme. The International University of Latin America, UNILA, represents an opportunity to strengthen the international position of a growing agri-business and tourism sectors.*

In 2007, the State of Paraná launched the “University without Borders” (*Universidade sem Fronteiras*, USF) to enhance regional engagement of universities and social inclusion of vulnerable population groups. Today, USF is present in 120 municipalities, which represents about 30% of the towns in Paraná. This initiative, based on collaboration between the public universities in Paraná, aims to increase higher education participation in the most lagging areas of Paraná. It offers undergraduate education and professional development based on the needs of the region (family-farming and dairy production, agro-ecology, community development, etc.). By the end of 2010, the state government had invested BRL 40 million in USF.
Multidisciplinary teams of academics, professionals and students work with associations, co-operatives and NGOs to develop projects in support of public policies and disseminate knowledge to the low income citizens. The University without Borders experience should be recorded, monitored and evaluated.

The Federal Government’s REUNI programme has helped enlarge federal universities’ student enrolment, bring in new faculty and improve facilities. For example, the Litoral campus of the Federal University of Paraná (UFPR), on the coast of Paraná was established in 2005 with the help of REUNI funding. Its undergraduate and professional education is aligned with local needs, featuring agro-ecology, environmental management, tourism, nursing and community development, etc. Thanks to REUNI funding, the UFPR Palotina campus, which focuses on agro-biology, has recently expanded greatly, increasing its enrolment five to six-fold.

The new International University of Latin America (UNILA) was established in 2009 in Foz do Iguaçu, next to the ITAIPU Technology Park and a state university (UNIOESTE) campus. With growing tourism activities, it is located at a strategically important crossroads between three countries and in the proximity of growing agri-businesses. This multinational venture, supported by the Federal University of Paraná, aims to attract 10 000 students and 300 faculty, half from Brazil and half from other Latin American countries. Teaching will be in both Portuguese and Spanish. Studies will included cross-border impact particularly in tourism and social studies and will capitalise on the cutting-edge research in environmental protection, water resources management and renewable energies conducted in the technology park. The Mercosul Institute of Advanced Studies (IMEA) was created as part of the project focusing on natural resources management, social studies and cross-border development and integration. The first 1 000 students began their studies in 2010. Consideration could be given whether this ambitious project would benefit from widening the recruitment also outside of Latin America and expanding its language requirements to include English. All students and faculty will need to improve their language skills if Paraná would like to position itself in the global market as an internationally attractive place to live, work, invest and study.

For education to be more relevant to the labour market and to boost entrepreneurship, education programmes should be aligned with regional needs and focus on students’ learning process and outcomes.
Several larger higher education institutions in Paraná concentrate primarily on national labour markets and career-focused education provision. Higher education institutions should move towards more demand-led education provision, to better develop student competencies and build stronger links between higher education institutions and the labour market. A wide range of measures could help, including credit-bearing work-based and co-operative learning for students, introducing problem-based learning methods in collaboration with local industry and other employers, as well as employer participation in the curriculum and course design. In addition, using local private sector employees as instructors and supporting mobility of university researchers/teaching staff temporarily to the private sector would be useful ways of improving labour market relevance. Finally, more data is needed on students’ employment outcomes and graduate destinations.

Encouraging steps have been made in aligning education provision with regional needs. For example, the Federal University of the Southern Border concentrates on agronomy, aquaculture, rural development, agro-industrial management and food engineering. The Federal Technological University of Paraná (UFTPR) is known for its commitment to close alignment with industry needs, mandatory work placement for all students and specific locally-based university programmes. The leading private institution, Pontifical Catholic University (PUCPR), has a regional vocational mission and also provides community service learning opportunities for students. Despite the progress made, positive developments to improve labour market relevance are taking place only in a handful of institutions. Initiatives to improve labour market relevance in higher education remain in most instances discipline-based and/or driven by individual academics. As a result, only a small proportion of students benefit from innovative approaches.

Due to rapidly changing skill requirements, up-skilling, re-skilling and other forms of lifelong learning are becoming increasingly important. To date, higher education institutions in Paraná are still geared more towards meeting the needs of traditional students than those of adult learners. While public universities face internal constraints due to the introduction of fees for lifelong learning activities, their efforts are also targeted narrowly to adult learners with university degrees. Currently, there are no mechanisms to recognise prior informal or non-formal learning. While the higher education institutions are aware of adults’ needs and have some programmes in place for them, not enough strong data is available to understand the needs of this population or the efficacy of higher education in meeting them. The Federation of Industries in Paraná (FIEP) conducted a review of the skills needed in the Paraná region, but this was a one-off study. Flexible ways of
provision should be scaled up to benefit non-traditional learners who often combine work and study.

Finding ways of increasing entrepreneurship could be an effective strategy to create jobs. Higher education institutions in the region have tried to boost university spinoffs and graduate entrepreneurship, mainly through incubators, but there is limited collaboration between the institutions. There is a growing, but limited offer of entrepreneurship training to students that tends to be delivered traditionally. Provision of entrepreneurship programmes should be scaled up, focusing on growth-oriented entrepreneurship while not neglecting social and cultural entrepreneurship, and by using interactive and experiential teaching methods.

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There is a need to address governance and quality assurance issues in the fragmented education system.

One of the main issues impeding human capital development in Paraná is the fragmented governance architecture and the absence of a region-wide co-ordinating structure and mechanisms to provide a long-term vision and implement an integrated development strategy for a wide range of types of educational institutions in the public and private sector, which is facing considerable quality challenges. Transparent pathways for students through the education system are necessary. This involves the development of more effective credit recognition schemes, course and programme co-ordination agreements, clear and enforceable policies related to credit transfer and increased support for joint and collaborative programmes.

The development of a quality assurance system is key to helping higher education institutions in Paraná improve their teaching, research and service functions. The current quality assurance systems focus on inputs rather than learning outcomes and institutional impact. A quality assurance system should place greater importance on graduates’ performance and benefit from the information provided by employers. By doing this, higher education institutions would capitalise on input for their academic programmes as well as strengthen ties with graduates, employers and the community at large.

Despite the fact that quality assurance is part of the Federal Government’s tasks, Paraná could explore the feasibility of establishing a state-wide independent quality assurance organisation or agency to which all higher education institutions in the state could be invited to participate on a voluntary basis. Such an independent agency could establish accreditation criteria competitive at the international level. At the initial stage, voluntary involvement could be supported with incentives offered to those institutions,
both public and private, willing to participate. By engaging key stakeholders in the process and by linking efforts more concretely with outcomes, incentives and institutional change, higher education institutions would take more “ownership” of their own institutional quality assurance systems as a tool for improving their institutional effectiveness.

The following measures would promote human capital development in Paraná:

- The state government and higher education institutions and interested parties should work together to improve the data on labour market needs and trends. Higher education institutions should systematically monitor student progress as well as students’ labour market outcomes and graduate destinations. The most effective region-wide graduate labour market systems are based on the collection of comprehensive labour market intelligence and on-line publication of the data in a single place. This improves students’ ability to make rational choices about their studies, helps graduates and employers to come together and helps students to move to employment. Effective labour market systems use the data strategically to identify regional and institutional priorities and help higher education institutions respond to the data in terms of course provision and the supply of employer-specified skills.

- The state government should explore the feasibility of establishing a state-wide independent quality assurance organisation or agency to which all higher education institutions in the state could be invited to participate on a voluntary basis. Such an independent agency could establish accreditation criteria competitive at the international level. At the initial stage, voluntary involvement could be supported with incentives offered to those institutions willing to participate.

- Higher education institutions and federal and state governments should continue and expand efforts to increase the enrolment and success of students from lower socio-economic backgrounds. These efforts should build upon international best practices of effective academic, social and financial support for students, long-term collaboration with secondary education institutions to improve students’ learning outcomes and raise their aspirations and adoption of more student-centred learning methods. Student aid programmes at the state level should be reviewed in order to ease financial burden of attending higher education and make loans more available to students.

- Higher education institutions should continue and strengthen their efforts to improve completion rates. The efforts of several higher education institutions
Higher education institutions should focus on the employability and entrepreneurial skills of graduates; providing students with the skills and competencies needed in the globalised knowledge economy. Stronger alignment of education provision with regional needs, closer university-industry collaboration, work-based and problem-based learning opportunities and programmes to develop transferable and entrepreneurship skills would improve employment outcomes of students. Similarly, efforts in language learning could help the region in its internationalisation efforts. All degree programmes should also include learning English.

The state government and higher education institutions should take steps to significantly expand higher education opportunities for working age adults. These steps should create clear and transparent pathways to advanced education for adults, including the ability to attend multiple institutions, obtain short-term education and training that can later be applied to degrees, and re-skilling and up-skilling courses and programmes designed around the particular needs and interests of adults who often combine work and study. The state government could consider establishing an agency to help recognise prior informal and non-formal learning.

The state and federal governments and employers should recognise the increasing relevance and importance of education in technical employment fields. There is clear evidence that needs and opportunities are growing in these fields, but that these trends are under-recognised in Paraná and within higher education.

**Innovation in Brazil and Paraná**

*Brazil has in recent years made strong progress in knowledge generation and capacity building for research and innovation. Despite the progress made, Brazil continues to have a low innovation rate and a low level of industry participation in R&D. Development in Paraná has been promising: the state has made investments in science and technology and public-private partnerships to boost industry participation in R&D, and the employers’*
associations have played a very active role in innovation activities. However, in contrast to many other states, Paraná has not yet passed a state law of innovation which can potentially jeopardise the good process.

Brazil has a strong focus on science, technology and innovation. It spends the most on R&D among the Latin American countries. It produces around 10,000 doctorates per year and is ranked 15th in global scientific publications and 25th in scientific citations. There are 270 business incubators and start-up companies, half of which focus on research and technology, and over 6,000 firms that have RDI investments valued at BRL 1.9 billion in 2008. The Innovation Law of 2004 established mechanisms to promote innovation and government-industry-academia collaboration. Despite the progress made, Brazil has a low innovation rate. R&D expenditure represents about 0.91% of the GDP. The new target of 1.5% of GDP within five years is a step in the right direction, and will bring funding in Brazil and in Paraná in line with other leading Latin American states. Private sector participation in RDI remains at a relatively low level (40%).

In the Brazilian context, Paraná has invested significantly in science and technology. Investments rose 48% between 2000 and 2007, increasing from 1.8% to 2.67% relative to the state public budget income. After São Paulo and Espírito Santo, in 2008 Paraná was third in the amount of state expenditure in science and technology (2.27% of the state public budget income). Paraná has introduced matched funding of 50% for federal investments in R&D. Since 2007, there has been a partnership between Paraná State and the Ministry of Science and Technology to develop a state-wide technology network as part of the Brazilian System of Technology Programme (CIBRATEC) that aims to develop state and national networks for supporting R&D activities in the private business sector.

Paraná also has an exceptionally active employer sector. The Federation of Industries of the State of Paraná (FIEP) was the first state industrial federation to respond to the national-level initiative aiming to identify potential sectors in Brazil. It has led the multi-stakeholder strategy work in Paraná, and has helped increase the knowledge base for innovation. It has funded a number of innovative university-industry projects. Public-private partnerships have been strengthened through the collaboration of FINEP (Federação das Indústrias do Estado do Paraná - Federation of Industries of the State of Paraná), FIEP, the SME-agency (SEBRAE-PR), Brazilian Institute of Product Quality (IBQP) and two technological institutes (LACTEC and TECPAR) to stimulate the development of innovation in
SMEs in terms of management, process and products through zero interest rate funding by FINEP.

Paraná has invested significantly in science and technology over the last decade. It has been one of the few states that has developed public-private partnerships to boost industry participation in R&D. However, in contrast to many other states, Paraná has not yet passed a state innovation law, which is currently in the state parliament. For this reason, the private sector has not been eligible to obtain public resources for R&D. The delay in the state innovation law could jeopardise positive progress as there is limited access to resources for supporting R&D activities and constraints remain for effective university-industry knowledge transfer.

Universities in Paraná have taken steps to engage in knowledge transfer activities but constraints remain ranging from limited human resources to a lack of incentives and institutional autonomy of public universities.

The large and diversified higher education sector in Paraná provides considerable potential to boost innovation. Considering that federal universities undertake the bulk of RDI in Brazil, Paraná is well-placed as its capacity has recently strengthened through the expansion of the of Federal University of Paraná (UFPR) and Federal Technical University of Paraná (UTFPR), and the establishment in 2009 of the International University of Latin America (UNILA) and the Federal University of Southern Border (UFFS).

However, the RDI capacity in the Paraná higher education sector faces many constraints. Poor second language capacity among RDI workers limits their ability to co-operate with international partners. Overall research production, albeit increasing, is low in international comparison. Also well-defined research priorities are lacking, resulting in research results that are poorly aligned with state and national objectives or needs. The narrow disciplinary orientation prevails in Paraná university’s RDI initiatives, which constrains innovation. The lack of common evaluation procedures and performance indicators for research and the rigidness of university-industry contracts lead to low productivity and inefficient use of resources.

Public universities and the leading private institution in Paraná, the Pontifical Catholic University of Paraná (PUCPR), are responding in their own ways to regional needs and developing their innovation activities. Most of them have established knowledge transfer offices and leading institutions also have active incubators. For example, the PUCPR has recently created a
Technopark (6 000m$^2$ at the initial stage but plan to expand to up to 40 000m$^2$). While there is limited data on the outcomes of these activities, the knowledge transfer offices lack the economies of scale or scope to optimally commercialise faculty innovations. They could consider widening the concept of knowledge transfer to long-term partnerships with industry, government and other partners in order to help support jobs, industry productivity and innovation in the region.

The relevance of universities depends on their ability to be responsive to regional and industry needs. Rigid bureaucratic control of universities hinders their autonomy and flexibility to play a more active role in innovation and regional development. Currently, the incentive structures for RDI, regional development and industry collaboration, remain limited, both at institutional and individual levels. Universities have limited scope for creating financial “headroom” to direct funds for specific innovation activities or development strategies, as 90% of the normal university budget is devoted to salary costs. Academic prestige and career progress is based on scientific excellence such as the number of publications in internationally refereed journals, citations, patents and awards.

With movement towards a cultural change within universities and increasing human resources in science and technology, universities are now starting to take a more proactive role in the regional innovation system. In order to support the positive change, there is a need to broaden institutional autonomy of public universities so that they manage their own budgets and payrolls, while strengthening their accountability.

The restructuring of RDI funding mechanisms in Brazil and Paraná is important for long-term sustainability and effectiveness of the RDI system. Reform to the existing institutional funding framework and the enhancement of project-based competitive mechanisms are essential aspects of the reforms. In the long run, greater investment is needed in specialised infrastructure for universities, including labs and technological incubators.

Finally, it is worth noting that while university technology transfer models may lead to saleable intellectual property and start-ups, they often do not produce enterprises that grow in the region and contribute to regional economic development. The creation of localised supply networks is therefore critical to the process by which innovation is transferred to enterprises and the development of new innovations to transform and upgrade existing industries. A well-functioning regional knowledge transfer model is based on the ongoing relationship between the university and industry to determine which innovations may be best to adopt and market, creating an industry-university learning environment. It supports the human
capital development required to adopt and apply process and product innovations and works with SMEs as well as large corporations. It measures success in terms of the sustainability and transformation of regional industry and employment growth.

The following measures would promote regional innovation in Paraná

- The federal and state governments should review the incentives for higher education institutions to facilitate a move from knowledge production to knowledge exchange and transfer, to encourage university-industry partnerships, to enhance universities’ more concrete participation in innovation activities and to ensure that universities perceive job creation as one of the main goals of innovation.

- The federal and state government should improve the evaluation and assessment of funded RDI initiatives to ensure accountability of the use of publicly allocated resources. These include criteria and measures of quality and relevance to the socio-economic needs of society such as: i) continued relevance of the RDI programme to its original stated objectives; ii) programme results and the achievement of objectives; iii) impacts of the programme on its stakeholders; and iv) cost-effectiveness of the programme.

- The federal and state governments should develop the existing funding models of higher education institutions to improve their accountability, specialisation and efficiency. A performance-based funding system introducing competitive funds could provide greater incentives for industry and regional engagement of universities. The system could also include: i) formulae for block grant funding that includes higher weights for enrolment of students from within the region, for students from lower socio-economic and/or migrant backgrounds or for enrolments in academic programmes related to regional labour market needs; ii) policies governing tuition fees to provide for lower fees for students from the region and policies for financial aid to students; iii) eligibility for special or "categorical" funding that could be contingent on evidence of regional engagement and focus; iv) requirements that institutions collaborate in order to obtain funding; and v) special funding to provide matching of funding obtained by universities from contracts with regional employers for education and training services. The state government could consider establishing a special regional investment fund (funded from public and private resources) to provide funding for building university capacity for regional engagement and provide incentive funds to institutions and individual faculty members for regional initiatives. These could emphasise engaging faculty members and students in teaching/learning and applied research
projects related to regional priorities. To ensure return on public investment and greater accountability, higher education institutions and state government should improve their follow-up and monitoring mechanisms to gauge the success of their programmes.

- The state government, in collaboration with leading higher education institutions and the business sector, should develop and implement a comprehensive, multi-year strategic planning process aimed at defining concrete goals for regional development, innovation, growth and sustainability, drawing on the multi-stakeholder strategy work conducted by key regional stakeholders. This should be conceived as a joint-venture between the public and leading private universities, business and industry. Efforts to unify the main goals for innovation in the region in the short- to medium-term should seek to identify a central focus. Innovation authorities should avoid pursuing too many goals simultaneously and/or dispersing resources. Co-operation among private sector businesses, public administration, regional/municipal development agencies and higher education institutions should be broadened. State government could also encourage stronger regional collaboration among the higher education sectors in Paraná. Collaboration between the state government and universities should be enhanced, for example, by mobilising university capacity to develop and implement regional development strategies and use university expertise for regional development.

- The state government could focus on cluster-based regional development, ensuring that research on clusters and industry-demand extends into the service sector, including clusters such as tourism. Clusters should be conceptualised as cutting across the manufacturing-service divide. For example, agribusiness clusters usually connect with tourism and manufacturing innovations incorporate service components. Technologies with cross-sector fertilisation potential should be promoted.

- The state government should implement collaborative efforts to improve the internationalisation of Paraná, its business sector and universities. It could consider funding targeted second language programmes, and providing adequate incentives for faculty to learn a second language in all higher education institutions promoting English as the second language of all RDI workers. It could consider establishing programmes to attract talent, high skills and professional technical labour (students, researchers, IT specialists, research scientists etc.). Policy instruments include employee tax incentives, repatriation schemes and improving the attractiveness of academic careers. To be more effective, these policies need to become an integral part of the
region’s international co-operation strategy. They can be coupled with initiatives to attract foreign investment.

- The state government should encourage collaboration between higher education institutions and local SMEs. Policy tools include people-based mobility schemes, such as the Knowledge Transfer Partnership in UK, which improve the absorptive capacity of local enterprises and support the forum-like role of higher education institutions in strengthening regional engagement channels. Innovation vouchers exposing firms to innovation activities and stimulating a market for innovation is one relatively low-cost policy measure that has been implemented in a number of countries, such as the Netherlands, the UK and Ireland. These vouchers are small sums that firms receive with which to undertake simple innovative projects. At the operational level, innovation vouchers can meet specific needs and objectives. For instance, they can focus on specific sectors or technologies, or indeed business-to-business collaboration by only allowing applications from groups of firms. Different rounds of calls for applications can be organised to meet diverse goals and needs.

- Higher education institutions should engage in more proactive, systematic and institutional collaboration with local business and industry to promote socio-economic development in the region. This collaboration should focus on areas where Paraná has a real or potential comparative advantage. Institutions should improve links with the local manufacturing sector to encourage the introduction of product and process innovations. Institutions should improve their capacity to engage with local industry by developing a regional development strategy encompassing technology transfer and innovation as well as new business generation and by establishing professional knowledge transfer offices that actively reach out to local business and industry to collaborate long-term. Single entry points for industry and SMEs within a higher education institution or a group of institutions should be encouraged. Universities should collaborate with local businesses to design research programmes and activities that are better aligned with regional needs and ensure that local firms are aware of the benefits of hiring graduates. Collaborative research programmes could help improve links between higher education and business sectors.

- The state government should implement concrete collaborative efforts with private and public stakeholders in areas that strengthen social equity and environmental quality. For this purpose, the state government should develop (or adapt) a specific regional funding programme for combined and collaborative efforts conducted by both public universities in higher education, science and technology projects. Higher education institutions should engage
in challenge-driven research, using the region and its diverse range of challenges as a “laboratory” to develop research and innovation. Integrating community outreach into training and challenge-driven research can generate improvements in life quality and low tech innovations.
Universities and other higher education institutions can play a key role in human capital development and innovation systems in their cities and regions. In the context of global economic and financial crisis, OECD countries are seeking to mobilise higher education institutions (HEIs) to support more strongly their economic, social and cultural development.

In 2008, the OECD/IMHE launched a second series of OECD Reviews of Higher Education in Regional and City Development to address the demand by national and regional governments for more responsive and proactive higher education institutions. As a result, 14 regions in 11 countries have undergone the OECD review process in 2008-11.

This OECD Review of Higher Education in Regional Development of the State of Paraná in Brazil (www.oecd.org/dataoecd/49/44/48569022.pdf) explores a range of policy measures and institutional reforms to mobilise higher education for the development of the region. It is part of the series of the OECD reviews of Higher Education in Regional and City Development. The reviews analyse how the higher education system impacts local and regional development and help how this impact can be improved. In addition to human capital and skills development, technology transfer and business innovation, the reviews also considers higher education’s contribution to social, cultural and environmental development and regional capacity building.

To know more about the OECD review process and requirements, visit Higher Education and Regions’ website at

www.oecd.org/edu/imhe/regionaldevelopment.