

Assessment and Recommendations

Chihuahua has been benefiting from Mexico's free trade policy and its geographic location...

Chihuahua has benefited from Mexico's trade policy change and its geographic position by thus creating a successful economic development model. Chihuahua sits right at the centre of the US-Mexico border sharing one-third of it, giving it direct access to both east and west coast markets in the US. Over the years, this intense international trade gave rise to one of the world's most dynamic border communities. This advantageous geographic location was the perfect ingredient for Chihuahua to be able to utilise three different external shocks. First, in a closed-economy context, the *Maquiladora* Programme enabled tax-free offshoring operations in border municipalities, which meant that Chihuahua had a key initial advantage over the rest of the country to industrialise. Second, after two decades of successful foreign direct investment (FDI) attraction to the region, Mexico opened up to trade by accessing the General Agreement on Tariffs and Trade (GATT), bringing additional impetus to the region through offshoring operations. Third, in 1994 Mexico signed the North American Free Trade Agreement (NAFTA), which expanded FDI opportunities for Chihuahua and other border states. The region was growing at average annual growth rates exceeding 9% in the 1990s and has become the largest FDI-based manufacturing employer in the country (through what is still being called *maquiladora*). Indeed, Chihuahua became one of the most dynamic regions in the OECD.

Free trade, geographical location and a long tradition in FDI-based manufacturing, have led over time to an economic transformation towards more technological activities in the state and the formation of some clusters with high value-added. Chihuahua is increasingly moving towards medium-high to high-tech activities that imply capital-intensive processes and both semi-skilled and highly skilled labour. Part of the state's success in climbing up the technological ladder lies in geographical location; many of the companies producing bulky items (e.g. electrical appliances such as fridges or engines for automobiles) that incur high transport costs, see location as one of the key assets of the region. However, the stock of human capital accumulated over decades of FDI in these industries might also explain a large part of Chihuahua's attractiveness. Clusters in Chihuahua are key because they contribute with a higher value-added than elsewhere in the country. Four of the main clusters in Chihuahua (i.e. automotive, electrical, electronic and IT) yield higher value-added than other states. Value-added per worker in Chihuahua was the second highest in electronics and third in IT in 2004. In the electrical and automotive industries Chihuahua is the largest employer displaying one of the highest specialisation levels in the country and among the top states in value-added per worker. However, the main challenge to further develop manufacturing in the region remains in connecting local firms to global value chains, which would enable to increase value-added and create channels through which technological spillovers can generate innovation.

Free trade and increasing flows of FDI has led the region to build useful assets in terms of human capital and innovation which could be a second nature advantage for the region. Chihuahua is the only state in Mexico with ten technological institutes which provide the manufacturing industry with at least 1 000 engineers every summer. Many of these professionals work directly in manufacturing plants, but some others work on design and engineering centres and some others in laboratories on telecom, environment, advanced materials and renewable energy. Such strong human capital flowing into industry is also supported by high quality education in the state. Chihuahua is third in the country's 2009 PISA results. Research and development (R&D) centres have appeared in the region since the mid 1990s and more recently design and engineering centres in global companies have set up operations in the state. High-quality professionals and innovation capacity are developing assets that the region can tap into as a second nature competitive edge.

...but the successful economic model has also rendered the region vulnerable to external shocks...

Chihuahua's growth rates have fallen dramatically during the past decade largely due to external shocks. The first of these shocks took place due to the US recession of 2001 and 2002, which led to deep annual contractions, particularly in 2001 that led to a -3.7% growth rate. For Chihuahua, the 2001-02 recession was partly due to lower demand from the US through the *maquiladora*. In addition, job losses were due to technological progress in electronics and mergers and acquisitions in the automobile sectors that resulted in streamlining process, closure of plants and massive layoffs. Chihuahua lost 107 000 manufacturing jobs between October 2000 and June 2002. The 2008 financial crisis became the second external shock to reveal Chihuahua's vulnerability. As Chihuahua's economy is intimately linked to US demand, the largest crisis since the Great Depression was bound to hit the region. After solid annual growth rates of around 4% between 2004 and 2006, Chihuahua's annual growth rate halved in 2007. By 2008 growth stagnated yielding a -10% growth rate in 2009.

...and also brought about new challenges

An outward development model poses a number of challenges. The high influx of FDI to the state has dominated employment creation. FDI has also influenced policy objectives and strategies, as well as entrepreneurs' activities. As a result, the government has made FDI attraction a core development objective and a number of local entrepreneurs have geared their activities towards investment attraction. However, the effects on the local economy are mixed. It is unquestionable that FDI has delivered the promise of generating jobs and has also raised wages in the north of Mexico. There are also clear benefits in terms of human capital development as FDI increases demand for skilled labour. However, there are still challenges in connecting these plants to local firms, to upgrade overall stock of human capital and to get the most of knowledge and technological spillovers. In addition, FDI inflows lure migrants from rural areas, migration increases land and housing demand and urban sprawl. Such self-reinforcing mechanisms can lead to environmental problems and increase the cost of providing services. In addition, while the government runs the risk of overlooking local firms' development, the number of entrepreneurs innovating is reduced as market incentives could encourage them into attracting FDI instead.

Structural challenges such as lagging productivity growth, employment rates and high young population inactivity affected performance even before the financial crisis

Chihuahua is among the many other Mexican states that are not making the most of their assets. Productivity is the key untapped potential for the state, as it alone can dramatically change performance in the short and medium terms. Productivity has been lagging with respect to the national average, and as a result, has contributed negatively to explaining GDP per capita differences between the state and the nation. In fact, the labour input was a factor that determined negative growth rates between 2004 and 2009. A more thorough economic growth analysis in this review shows that labour productivity and technological progress are areas of opportunity to trigger and sustain growth. Another factor contributing to a lower-than-expected performance is employment rates. Chihuahua, due to the recession during 2001-03 and the recent financial crisis, has not been able to create as much jobs as it would require to boost GDP per capita levels. Like most leading states, Chihuahua has a demographic bonus. Although the size of the potential labour market and the participation rates are factors positively influencing Chihuahua's GDP per capita, Chihuahua had in 2004, the nation's seventh largest inactivity rate and the second among border-states. Although a portion of those not studying, nor working (*NiNis*) are stay-at-home parents, such high inactivity rates could signal fewer opportunities for the younger population.

Sluggish economic growth is also related to the need to channel more resources for infrastructure and to foster private investment under an integrated approach to regional development

Although Chihuahua's public investment has been growing fast since 2005, it is lagging behind those being made elsewhere in Mexico. The state and municipal governments have certain capacity to determine infrastructure expenditures that has not been fully exploited in order to foster growth. A large part of regional and local funds are earmarked transfers from the Federal government but there is some self-determining capacity that may be underutilised: five out of every six Mexican pesos in public investments made in 2010 were regional or local funds. In addition, infrastructure projects have not been targeting economic activities. Connecting regions within the state through roads and motorways is a strategy that can open new markets and bring about progress to peripheral regions in the state. However, policymakers need to be aware that infrastructure provision requires an integral approach for regional development that leads to a co-ordinated policy on infrastructure, private investment, human capital development and innovation. Road and motorway building, while having a short-term positive impact, may lead to a leaking by linking effect, so the unintended consequence of an unco-ordinated policy could be a brain drain and a concentration of private investment in the main urban centres of the state. Therefore, the state should consider mechanisms that ensure that infrastructure, education, private investment and innovation policies are co-ordinated at the local level to ensure regional development and overall growth.

Chihuahua has experienced solid investment growth rates even during a crisis period, but assets are still heavily concentrated in a few sectors and clear opportunities emerge in primary activities. Two-thirds of assets are in two sectors: utilities (electricity, water and gas); and manufacturing. Private investment shares follow a power law, which has important implications for policymaking. If investment can spur growth, but the former is

heavily biased by a few sectors, easing investment in low-share sectors is an opportunity that can reduce overall risk in the economy by diversifying it and can boost investment levels by paying attention to opportunities. One such opportunity lies in agriculture, cattle-raising, forestry and fisheries. Although this sector had the strongest asset growth between 2003 and 2008, it also had the second lowest share of total assets with only 0.04%. Given Chihuahua's natural advantages to grow a variety of crops, particularly perennials, and for cattle-raising and forestry, the sector is but one example of where Chihuahua can focus to foster investment and growth. It is also a sector that can help bridge the gaps between urban and rural areas in terms of employment and income.

Although Chihuahua has made strides at improving the quality of education and to reduce the skills mismatch in the labour force, there is still room for improvement

Tertiary education skills are scarce and concentrated in a few municipalities. Educational attainment in the state is lagging, not only by OECD standards, but also in relation to the rest of Mexico. In 2008, only one in eight people in the labour force (15-64 years old) in Chihuahua had a tertiary degree. Chihuahua's education system seems to be relatively more effective than that of most Mexican states, although the average is poor. Failure to complete higher studies requires attention since less than 13 students enrolled in Chihuahua's university graduates. Tertiary education skills are not only scarce in the state, but they are also extremely concentrated. In 2010, three in four graduates lived in either Chihuahua City or Juárez and nine in ten lived in only six municipalities. While skills concentration is a common process, concentration of skills in Chihuahua is higher than any other OECD country or than in Mexico.

Although the quality of education has greatly improved, high dropout rates are an endemic problem in the Chihuahua educational system. The 2009 PISA results for Mexican states show that Chihuahua has moved to third place up from tenth in 2006. However, quality of education can still be improved as scores for Chihuahua are still below the OECD average. In basic education, the state has the sixth largest drop-out rate, with 12.3% of students not concluding primary instruction compared to the average for Mexican states at 8.6%. The current administration is making a great effort to open up opportunities for students to stay longer hours in school, and for enrollment in university when they decide to do it. However, emphasis should be placed on making it possible for students at all levels to finish their degrees whilst further improving the quality. Although the benefits of multi-national enterprises' (MNEs) presence for human capital enhancement are commonly accepted, it is equally clear that their importance is significantly less than that of general (public) education. The beneficial effects of training provided by FDI can supplement, but not replace, a generic increase in skill levels.

The new government's efforts in education are paying off in terms of coverage, but there is still room for improvement by focusing on increasing terminal efficiency. Currently the focus is on access to education by building 12 new universities which is as much as the state has built in the last 40 years. The new administration has also built 3 technical colleges and will build five more in 2012, as well as ten new upper highschools (*Colegios de Bachilleres*). In addition, and on opening full-time primary and secondary schools that make children stay more time in school rather than on the street. The new administration has already managed to bring secondary education coverage to 68% in 2011, up from 64% in 2009 and increase university coverage to 29% to 38% during the same period. These will all be very beneficial actions. However, for these to have a

positive impact on productivity and growth, the government should also pay attention to terminal efficiency (the proportion of students graduating).

Improving educational outcomes requires a systemic approach that touches upon most elements in the system. The key problem is not a lack of resources. Chihuahua spent 52% of the 2011 budget on education. However, inefficiencies and misallocation of spending together with weak incentives for education professionals to perform well, have curtailed performance in the past. The new administration should nevertheless, be aware of some guiding principles that could be taken into account in reforming education policy for better performance:

- *Focus on a limited number of measurable, ambitious and plausible educational goals and commit to achieve them.* These goals should be easy to understand to the public and resonate with professional educators. Commitment should be reflected in publicly announcing these goals. There are a number of goals that can be set:
 - Raising educational attainment. Currently the focus is on access to education by building 12 new universities which is as many as the state has built in the last 40 years, and on opening full-time primary and secondary schools that make children stay more time in school rather than in the streets. These will all be very beneficial actions. However, for these to have a positive impact on productivity and growth, the government should also pay attention to terminal efficiency (the proportion of students graduating) by:
 - Raising secondary education attainment levels. Although 28.3% of population aged 12 and older had some secondary instruction, those that had a degree stood at 19.9% of population 12 years and older in 2005. A number of measures can be introduced. For instance, introducing the Quality Schools Programme (*Programa de Escuelas de Calidad*). It is also likely that the Full-Time Schools Programme that the State Government started in 2011 with 200 schools will have a positive impact on raising secondary attainment levels.
 - Raising upper secondary educational attainment levels. Almost one-quarter of those aged 12 and older had some upper secondary schooling in Chihuahua which is higher than the 19% at national level, but well below the OECD average of 44%. However, only 10.3% of total population aged 12 or older had an upper secondary degree. In 2011, Chihuahua was the first Mexican state to offer upper schooling opportunities to every student wishing to study. While this in itself is a great achievement, ensuring those new students finish school should be one of the main policy focuses in order to seize such a newly acquired asset and turn it into educational attainment that can have an impact on the labour market and productivity.
 - Raising tertiary education attainment (14.2% in 2006, lower than the national average at 14.7%, and lower than the OECD average for TL2 regions at 24.3%). This remains key if Chihuahua wishes to compete nationally and internationally.

Increasing the coverage of early education (currently at 70% of total population aged between three and five). This will not only have an impact on student performance at later stages of education, but also will increase female participation rates as women are able to engage in productive activities. While improving coverage at pre-school age will have definite impact, the

three-year old group shows a particular lower coverage at 46% which contrasts with the 86% for four-year old group and the 78% for those aged 5.

Increasing quality of education:

- Raising test scores at ENLACE and PISA tests. Chihuahua has already taken strides at improving the PISA score, but further improvement is necessary.
- Reduce repetition rates. During the 2010-11 academic year, upper-secondary repetition rates stood at 37.4%. Repetition rates can be improved on average by 0.31 percentage points by introducing the Quality Schools Programme.

Broadening educational goals to include an integral approach to human development and incorporate arts, humanities and civics.

- *Emphasise the role of developing educators.* Recruiting, educating, training, developing and supporting educators is paramount in a human capital development strategy. The quality of teachers is the single most important school-level predictor of student learning.

Place strong financial and professional incentives to attract young and highly skilled people to become educators. Smaller classrooms (lower pupil-teacher ratios) and better teacher wages that are linked to performance are associated with higher returns to schooling in the labour market.

Place a similar emphasis in life-long training for educators to continuously improve the quality of teaching

- Strike the right balance between encouraging innovativeness and autonomy at school level and exercising monitoring mechanisms that promote accountability. Schools with greater autonomy tend to have better student performance, but only if autonomy is aligned with accountability measures.

Technical training linked to firms and universities are key to Chihuahua's progress. The Council for Academic-Productive Linkages (COVAP) has been instrumental in enabling curricula redesign, productive reconversion programmes and designing of new degrees. However, COVAP's very successful work should continue to concentrate on removing market failures such as asymmetric information and avoid funding activities that can be financed by private firms themselves. Chihuahua should also continue to foster technical degrees that are highly connected with labour market requirements. Technical university degrees have been a successful vehicle to address the skills mismatch in the labour force and this new state administration is further investing in technological universities outside of Chihuahua City and Juárez which will also help reduce inequality in access to technical training. It would be advisable however, to look into transferring programmes to the four big public institutions for students wanting to take their studies to tertiary education as the Technical Metropolitan University of Mérida in Yucatán has done. In addition, high-tech training institutions such as those co-ordinated by the Institute to Support Technological Development (INADET) could look at ways in which to co-operate with COVAP to upgrade the technological level of their activities.

Despite that some innovation is taking place in multi-nationals, the rest of the economy is not linked to the innovative capacities in the state partly due to limited resources and institutional obstacles

Despite that the state has developed private and public R&D institutions that are unique in the country, they are seldom used by firms, so the potential benefit is wasted. Chihuahua is lagging behind not only most OECD regions, but also many Mexican states regarding inputs for innovation. Chihuahua comes 17th among Mexican states in its share of high-calibre researchers. As a result the local supply of innovation inputs is curtailed by a low level of human capital in relation to the production of R&D. Not surprisingly, Chihuahua produces an extremely low level of patents: one patent application annually per million of inhabitants – lower than the Mexican average. Links for co-patenting are few and mainly local or domestic and the international character of Chihuahua is under-utilised to foster innovation.

Scanty resources for innovation are a limiting factor for innovation. Chihuahua should take advantage of Federal funding, but matching such resources to local needs and cluster development objectives. In addition, Chihuahua should seek to further involve the private sector, develop an innovation plan and creates State-level programmes to foster innovation. Low levels of funding attracted by the state could be partly related to low involvement from firms and the private sector. It is important for Chihuahua to start proposing Mixed Funds (FOMIX) resources on the basis of firms' needs and strategic cluster development objectives.

Institutional obstacles for innovation can be attributed to a bias towards pure scientific research, which might be limiting entrepreneurial potential in Chihuahua. Chihuahua's Council for Science and Technology should develop a clear plan with measurable objectives that have an impact on firms. Like many Mexican states, Chihuahua has a Council for Science and Technology, as well as a law, but no plan for innovation. In order to have an impact on market-oriented innovation, Chihuahua could consider having the State's Council for Science and Technology being co-ordinated by the Secretariat of Economy which is in a better position to link up with the private sector. Linking the Council to the productive sector will be a way to foster innovation networks and spur productivity through innovation in firms.

Innovation capacities can be better exploited by linking actors, developing networks, and taking advantage of FDI flows and the international character of the region

Chihuahua can also take advantage of high-tech clusters and local R&D capacities to provide market oriented innovation. In particular:

- *Chihuahua should consider establishing mechanisms to link HEIs and R&D centre's innovative capacities to firms' needs.* Higher-education institutions (HEIs) and R&D centres are key to developing a regional innovation system. HEIs have already played a crucial role in producing a qualified and specialised labour force for Chihuahuan local markets. However they can also be the source of market-oriented R&D by providing firms with innovation inputs, through consulting contracts, joint projects or help generate new innovative SMEs through incubators. In the case of Chihuahua there are few examples of firms' innovation through support stemming from HEIs or R&D centres. Despite some attempts

from the Secretariat of Industrial Development in previous administrations in co-operation with one of the state's most important business associations, DESEC, to link CIMAV's patents and research to potential investors, virtually no benefits have been derived locally. In contrast, businesses in Monterrey in the State of Nuevo León, have been very active in asking for practical solutions for their plant-level problems to CIMAV working from Chihuahua.

- *Chihuahua should consider developing innovation networks around developing high-tech clusters.* Non-HEI research could be an alternative that complements academic R&D. For example, the Jalisco Institute for Information Technologies supports initiatives in the IT sector. Guanajuato created a state innovation observatory as well as innovation networks linked to the state's strategic sector priorities. Querétaro trains firms in innovation processes, partly funding innovation seminars and grants financial resources for firms seeking to attend innovation-related events.
- *Chihuahua could find complementarities in aligning its FDI strategy with an innovation policy.* Inward R&D-intensive FDI is a powerful mechanism for technology transfer. Receiving regions as a result can develop specialised clusters and integrate local firms in global value chains. Chihuahua is already successful in attracting FDI and some innovation capacity is already in place. In fact, some design and engineering centres in the automotive sector already have a base in one of the two largest cities in the state. By partly focusing the FDI-attraction effort towards R&D-intensive activities, Chihuahua can generate technological spillovers through international technology transfer. However, R&D-intensive FDI alone won't necessarily bring about the expected benefits if the links between local HEIs and R&D-intensive FDI are not made. The relatively recent case of Visteon being located physically contiguous to the ITESM Campus Chihuahua is an ideal model to follow.
- There are clear opportunities in encouraging co-operation in R&D both locally and internationally (particularly in neighbouring US states). Knowledge spillovers can be fostered by encouraging co-patenting and other forms of co-operation in R&D locally. In addition, being a border state, Chihuahua can take advantage of international knowledge and benefit from spillovers which can act as local externalities.
- Chihuahua should upgrade the government's role in fostering incubators by taking stock of HEIs and R&D centres, as well as by setting up clear strategies and objectives.

Policies to foster productive activities should aim at linking local and global firms with a strategy that focuses on maximising the benefits of FDI

The State government places an overwhelming emphasis on FDI attraction, but the strategy can be improved by striking a balance between inward investment and local firm development. There is no question on the benefits that FDI has brought about to the state in terms of employment and capital deepening, but the effects of knowledge and technological spillovers are less evident. Overall the manufacturing development strategy is overly focused on FDI attraction. The first nature advantages of the state such as geographical location that reduces transport costs and takes advantage of lower

operational costs are powerful FDI magnets. Further developing skills, seizing R&D capacities and preparing local firms to become suppliers can become second nature advantages that will increase the region's attractiveness whilst fostering endogenous growth and partly addressing the region's vulnerability to external shocks. As state-level SME-related programmes for manufacturing are underfunded, do not particularly target access to finance, and are disconnected from an FDI strategy, long-run economic performance can be strengthened by allocating greater resources to programmes aiming at financing SME development and linking them to global value chains (e.g. FIDEAPECH and CEDEP). As the state's finances are already under strain due to increasing indebtedness, programme and department duplicities and cumbersome administrative costs, some programmes can be sources of savings to increase resources for actual productive-development support. However, even with these savings, a clear need to reflect local firm development support in strategy and budget is likely to remain. Chihuahua should consider strategies such as connecting local firms to global value chains by:

- *Fostering cross-agency cluster working groups.* The Suppliers Development Centre (CEDEP) can join the *maquiladora* associations (AMAC and AMEAC) along with CANACINTRA (the National Chamber of Manufacturing) and other actors to create teams that foster the creation of cluster-specific teams that address particular issues such as the aerospace cluster that has been working with ITESM (Monterrey Institute of Technology Campus Chihuahua), DESEC and the State Government to attract and develop the cluster. Cluster-specific working groups can then decide on a number of issues such as the benefits of *branding and marketing* the cluster. Again, making the most of the fact that the Council for Economic Development of the State of Chihuahua (CODECH) is already in operation could also be a potential partner for CEDEP or alternatively let the Council lead the *working groups* with the participation of CEDEP.
- *Support export networks.* CEDEP can also join forces with PYMEXPORTA to identify and help develop export-potential firms.
- Promote the establishment of technology standards among potential suppliers.
- *Help establish and co-ordinate public procurement for groups of firms.* Clusters and SMEs can also be strengthened by public procurement policies such as providing financial resources to enable SMEs to participate in public procurement as long as this is done in consortia. Chihuahua could be interested in studying the Polish Agency for Enterprise Development which provides financial assistance to consortia of SMEs to get engaged in public procurement or Brazil's State of Ceará.
- *Promote spin-offs through designing incentives.* This is a key component of developing suppliers. The 40-year-long manufacturing experience boosted by the *Maquiladora* programme should have been a crucial asset for spin-offs from FDI-based companies to be generated. Instead very few cases of spin-offs have been identified in the 40 years that *maquiladoras* have been installing operations in the state. Incentives that ease start-ups, facilitate access to finance (see above), and grant similar benefits as those for FDI should be a few of the examples that should be explored. Infrastructure for spin-offs is also crucial as the experience from the UK Cambridge and Oxford clusters, as well as in Finland and Norway show. Training and guidance of entrepreneurs is also key for spin-offs as in the cases of Georgia in the US, Japan and Korea.

- *Liaising with firm-development funds to support the creation of pre-seed venture capital funds.* CEDEP could liaise with State's Trusteeship to Foster Activities in the State of Chihuahua (FIDEAPECH) or the Federal Fund for SMEs (*Fondo PYME*) and generate innovative mechanisms to offer pre-seed venture capital for firms that have the potential of becoming suppliers.
- *Seek the integration of innovative firms or R&D actors in the cluster.* Innovation is another key ingredient in cluster development and thus supplier development programmes such as CEDEP should seek liaising with the State Science and Technology Council (COECYTECH) and research centres to foster the innovation content of local clusters.
- *Seek local firms' productivity growth through training and quality control by MNEs.* Two mechanisms that MNEs in other countries have undertaken leading to increases in productivity levels by local firms is on the one hand, training of engineers and other technical workers in the MNEs often at their headquarters; and on the other, visits to local firms to suggest ways in which efficiency can be increased and the desired quality be achieved.

Institutionalising regulatory reform can also help foster local and foreign investment

Competitiveness in Chihuahua's main urban centres is being challenged by deficiencies in regulatory reform in particular for start-ups. Starting a business and dealing with construction permits are areas with particular room for improvement. These two factors can be improved through policies since both are fully or partially competencies of local and state governments. Chihuahua should strengthen the role being played by the Fast Start-up System for Enterprises (SAREs) in different municipalities and continue to couple their efforts with those provided on advice and guidance by the Enterprise Development Centres (CEDEMs). Integrating services related to fiscal, labour and environmental obligations would be key to speeding up and facilitating the way in which start-ups take place in the region. As SAREs are municipal efforts guided by the Federal government (COFEMER) and with the support of the State government, municipal involvement is essential. One way of achieving this is by creating the right local incentives. CEDEMs can continue to house SAREs, but should also look at ways to further integrate services, such as providing a physical space for municipalities' local economic development directions as well as the local Councils for Economic Development that stem from CODECH. As a result, entrepreneurs would have in place most of the services and support needed to start-up and operate, and have different bodies interacting with the local Councils that can provide a strategy.

Chihuahua must also consider moving into the institutionalisation of regulatory reforms. In addition to resolve pending issues concerning insecurity and improving regulatory reform in certain areas, a challenge in Chihuahua is to embed regulatory reform and best practices in the regional governance system. The institutionalisation of regulatory reform requires clear political leadership that puts the regulatory and competitiveness factors as interdependent and as a priority of regional governments. Chihuahua's Congress could consider creating a law for regulatory reform or alternatively, make reforms to the existing Law for Economic Development to include this aspect as the State Development Plan suggests. In addition to what the Legislative power could do, the Executive could consider creating a decentralised entity or take advantage of one existing structure that can push the regulatory reform.

The elements might be there, but what is missing are the links in the economic system

Chihuahua has many of the elements to reignite growth and sustain it over the long-term, but an effort of connecting policies, actors and institutions is key to boosting growth and development. Productive-sector development policies in Chihuahua should aim at increasing productivity and value-added through SME support, as well as linking local companies to MNE value chains. Policies oriented towards infrastructure, private-sector development, education and innovation need a better link that improves co-ordination and achieves regional growth. FDI policy requires the link with local supplier development policies that help maximise the benefits of free trade and the four-decade long manufacturing development experience in Chihuahua. Opportunities in primary activities can also be realised if the links with manufacturing that enable higher value-added are made possible. Quality of education has improved, but converging towards OECD standards requires that the school-family links are strengthened. In this way goals are set at a neighbourhood level with strong state-level guidance. It also requires that socio-economic conditions affecting attainment and leading to high dropout rates are addressed. The already significant innovation infrastructure needs linking education, innovation and private sector actors and in particular helping establish the link between local entrepreneurs and R&D capacity. R&D can also be spurred by making international connections across the border possible. An economic policy that addresses inequality is also possible if social concerns are brought to the table when designing economic policies and if the urban-rural linkages are strengthened.

Chihuahua's inequality is manifest in larger regional disparities than the OECD or among Mexican states, marked gender inequality and the widest inter-ethnic inequality in the country

Chihuahua's regional disparities are larger than what any other OECD country – including Mexico—experiences. If Chihuahua was a country, it would be the place where the greatest regional disparities would be found. Although Mexico is the OECD country with the largest regional average household income inequalities, Chihuahua's range of income is wider than the one that can be observed among Mexican states. Such a wide income gap is fuelled by the types of occupations. Four in every ten employees in Chihuahua are performing unpaid work or earn less than twice the minimum wage (roughly USD 8.80 per day); the proportion expands to two-thirds of total employment for those earning less than three minimum wages (USD 13.20) per day. Marginalised neighbourhoods are present in some rural communities, but they concentrate in urban areas. Six out of ten marginalised inhabitants in the state are urban dwellers of one of state's largest cities. Chihuahua also experiences gender inequality in income. While 36% of men earn less than twice the minimum wage, the proportion reaches 48% for women. In fact, almost eight out of ten women earn up to three times the minimum wage compared to seven out of ten men. But gender inequality is not limited to income but it also includes their role in the family and society. Out of the 635 000 Chihuahuan females with over 15 years old that had a partner living with them in , over 46% of them experienced some sort of violence. Chihuahua is also the Mexican state with the largest inter-ethnic inequality. The human development index (HDI) levels for Chihuahua's non-indigenous population stood in 2006 at 26% more than the levels for indigenous groups. Inequality is particularly acute in municipalities with difficult geographical access where the vast majority of indigenous people live.

Federal programmes are being instrumental in helping fight poverty and marginalisation, but complementarities between social and economic policies should be sought as the Chihuahua Vive Programme has started to do...

Federal and state governments are providing useful help to address inequality, particularly for women and children development. Social policies can be complementary to those that seek efficiency just as economic growth can reduce inequality. Central-level programmes such as *Oportunidades* and *Estancias Infantiles* are having real impact in the lives of people. These are policies that not only have a social benefit, but also can influence economic performance. The former can be linked to lower dropout rates and better academic achievements that improve skills' levels in the region. The latter can be argued to help mothers get economically active while improving children's attainment. The state-level Community Centres are good yet underfunded initiatives that are empowering women and allowing children to achieve better grades and get the most out of education. However, training programmes are needed for personnel in these community centres, which could have an enormous payoff in terms of achievement at school. Reading improvement programmes can also be put in place in these centres linked to an overall strategy to improve overall educational quality. Ethnic inequality can also be addressed by linking Secretary of Economy's programmes, in particular the Employment in Marginalised Areas, to the social work that the *Coordinación Estatal de la Tarahumara* is likely doing.

However, for complementarities to be effective, a long-term vision and strategy is needed. One-shot redistributions cannot have long-lasting effects. Short-term aid does not affect the unique invariant distribution of income. The state of Chihuahua can evaluate how a long-term strategy can have a durable effect on income and growth can be set up. Perhaps current programmes in different departments can be redesigned to include economic and social aspects. For example, the Secretariat of Social Development and the Secretariat of Economy can constitute a task force to look at employment, poverty and health aspects of their programmes so that they are linked and mutually reinforce.

Under such a scenario, the new administration created the *Chihuahua Vive* Programme, which is a suitable mechanism to make actors and programmes converge and provide a vision not only for social but for overall wellbeing. *Chihuahua Vive* along with federal-state level co-ordination on social policies can lead to complementarities with economic strategies (e.g. policies to increase participation rates and upgrade skills) and can result in the inclusion of women, disadvantaged groups and ethnic minorities. *Chihuahua Vive* seems to be an effective tool to foster policy complementarities that other Mexican states could emulate. Chihuahua also has already in place a Programme for Employment in Marginalised Areas, which needs to establish links with *Chihuahua Vive* and that needs to further seize funds from the federal government (as they are currently underexploited), which can be used to test other social aspects that can be incorporated or mechanisms in which the programme is linked to other social requirements.

...but complementarities are better exploited at the local level when an integrated approach to regional development is adopted

Growth-enhancing and efficiency-seeking economic policies can be complementary to equity-seeking social policies; but complementarities can better be exploited at the local level. Space matters for policy complementarities. On the one hand, traditional

views on regional policy related to the old paradigm saw regional policy as a compensatory mechanism to foster convergence. On the other hand, some national governments can regard investing in lagging regions as sub-optimal as cities make the best use of skills, ideas and knowledge. However, lagging regions represent unrealised potential for growth that is not in detriment to urban dynamism. Enhancing growth in lagging regions can produce a convergence trend so equity is addressed. Growth in rural areas complements urban growth as specialisations are different and comparative advantage enables exchange and efficiency. Similarly, talking underserved neighbourhoods in urban areas directly addresses inequality, but as a consequence leads to better urban mobility if transport infrastructure is provided and increased productivity, to name a few positive effects of complementarities that can better be realised at the local level. Inequality is not only related to income, but to the overall environment in which communities thrive. Place-based approaches to policymaking (e.g. Federal *HÁBITAT* Programme or *Microrregiones*) that transform the built-up environment can reduce inequality and deliver efficiency at the same time. In

Chihuahua's new government administration is aiming at liking rural communities and small and medium-sized cities in the state by building or rehabilitating ten airports and airfields, and doubling motorway infrastructure. Some of the airports are located in the mountainous regions which would help better link rural communities and provide better access to ethnic minorities, whilst potentially boosting tourism in those areas. Chihuahua's road infrastructure is currently the 9th in the country in terms of absolute length, but it is the last one if the size of the state is taken into account (length of roads with respect to total area). The 7 109 km long road infrastructure includes the second largest four-lane motorway system in the country that connects 80% of the population in the state. The new administration aims at connecting remote rural areas with small cities through paved rural roads, the construction of secondary motorways and seven large inter-state motorways. In addition, border-crossings are being modernised.

Chihuahua's objective of doubling motorway infrastructure by 2016 should take into account that local economic development requires integral place-based policies that include human capital development and business environment. The new administration has worked on 80 different motorway axes since it took office in October 2011. Four-hundred additional kilometers are also being modernised (Duarte, 2011). Motorway links are expected to improve connectivity with neighbor states Sonora (to the West) and Sinaloa (to the southwest) in an effort to gain access to seaports and thereby access to Asian markets (Duarte, 2011). The ultimate goal is for all municipal government seats to be connected through paved motorways (Chihuahua State Government, 2011). Nine marginalised municipalities will be connected through roads by the end of the administration. While in themselves these actions are well-intentioned since they aim at opening regions to markets and to reduce marginalisation and extreme poverty, transport infrastructure alone is unlikely to provide long-run growth. Providing infrastructure alone can lead to a leaking by linking effect. As infrastructure will reduce transport costs, these in turn will make it more profitable to concentrate production in main urban centres and ship it from there to more remote areas. Providing human capital development while very positive, would likely accelerate the outmigration tendency from remote and rural areas to urban centres and abroad. These two policies (infrastructure and human capital) require an integral strategy at local level that spurs local firm development that benefit from lower transport costs and skills in the labour market.

Such complementarities can appear by fostering a city-region approach that nurtures partnerships and co-operation

Chihuahua has an enormous breadth of urban planning efforts that need political support at the local level particularly in the cases of Chihuahua City and Juárez. Given the low density levels, rising urban sprawl and the cost of providing services to a growing population, Chihuahua's urban planning can focus on three vital areas: *i)* improving urban land regulation, *ii)* linking an evaluation of deviance from official plans to better enforcement of approved land policies, and *iii)* adopting a city-region perspective that supports inter-municipal partnerships and co-ordination:

- *Improving urban land regulation in Chihuahua:* A split-rate property tax, which places proportionally higher taxes on land than on built structures, could support the City of Chihuahua's objectives to reduce vacant land. This could also be useful in Juárez whose density and sprawl is even more acute. Alternative densification tools beyond density thresholds could also be deployed, such as dynamic height control for areas surrounding its downtown core. Increasing the number of building and land inspectors, as currently done in Chihuahua City, would reduce the deviance from official land regulation. The bus rapid transit programmes could help create a more dense urban form if they supported transit-oriented development (TOD) that permits higher densities along a mass transit corridor.
- *Supporting ex-post evaluation and monitoring:* It is not known whether strategic urban and regional plans in Chihuahua have their intended impact. Mexican urban planning has traditionally lacked attention to monitoring and implementation, e.g. there are often few explicit statements about timing and sequencing of development and public facility provisions. *The Chihuahua State government and local municipalities could consider integrating monitoring and evaluation as permanent features of their urban plans. The Federal government could also provide technical assistance and capacity building for local officials to measure plan implementation and compliance.* Monitoring land policy merits specific attention given the proliferation of informal settlements, the evidence of illegal land sales, and the role of urban planning for supporting economic activity and safeguarding environmental resources.
- *Facilitate city-region networking to improve service delivery:* Co-operation among local governments in functional areas remains limited in Chihuahua. Voluntary modes of co-operation among adjacent municipalities could be encouraged and policy frameworks could explicitly acknowledge city networks and develop delivery agreements at the metropolitan or "micropolitan" levels. Given the proliferation of small, tightly connected municipalities in Chihuahua, a "micropolitan" scale would be helpful for organising inter-municipal partnerships. Additional projects and funding would be needed to integrate sister city agreements into the region's long-term common strategic goals and to build a stronger policy framework to support an interconnected urban system. A contract covering an entire metro-region would allow policy makers in Chihuahua to increase policy coherence across the city-region area.
- *Make planning institutes more inclusive, expert-based and metropolitan.* There is a need to increase planning institutes' effectiveness, encourage co-operation and overcome political obstacles and politicisation of these bodies. Urban experts

from academia can join council boards and planning institutes should incorporate their views. In order to increase inclusion and strengthen the potential benefits of having experts' views, citizens and civil society representatives should join these councils and should be decision makers in cities' plans. Moreover, these plans should go beyond administrative boundaries and incorporate the functional area where applicable. This will not only increase the relevance and effectiveness of plans, but will balance power within the institutes.

Rural development requires better linkages with urban areas, a better management of land and water resources, access to credit and the further introduction of processing as the means to higher value-added and jobs

Urban areas currently play a leading role in state economy, but there is great potential for rural areas to contribute more to the economy and for levels of rural income and employment to significantly improve. With increased urbanisation and the growth of the *maquiladora* programme, the role of farming in the economy of Chihuahua has declined. While the rural economy encompasses more than farming (e.g. mining, renewable energy), in Chihuahua it is currently the backbone of the rural economy. Thus, rural development in Chihuahua requires a transformation of agriculture as a fundamental first step to rural development.

Chihuahua is well positioned to further penetrate North American markets, but increasing value-added in agriculture remains a key issue. It has easy access to the US border and the infrastructure to accommodate exports. The high productivity larger farms in Chihuahua are already competitive with US and Canadian counterparts in terms of scale and productivity and they have the advantage of a different growing season and much cheaper labour. But low-cost labour is of limited value in the production of low value commodities. For grains and other bulk commodities, capital in the form of farm machinery and transport and storage facilities more than offsets labour as a source of productivity. Canadian and US grain producers also have a huge advantage because they largely avoid irrigation expenses due to higher precipitation levels. As water becomes scarcer and eventually more expensive in Chihuahua, the competitive position of cereal producers will decline. Although Chihuahua's agricultural sector is among the most productive, specialisation on the part of small farmers on low value-added crops entails low output per hectare.

An improved rural economy in Chihuahua depends upon improved economic performance of the market towns in the state. The two dominant cities in Chihuahua now account for the majority of the population and are the focus of policies to stimulate urban growth. However, there are real opportunities to enhance the role of the other urban places in the state, but by following a different strategy. While food and agriculture is seen as a growth opportunity for Chihuahua, it can best be achieved by a conscious and systematic effort to couple improved farm level productivity with agricultural processing. Processing is important to expand foodstuffs' market and as a source of local jobs and income. Processing expands the market for farm output by expanding both, the geographic reach of farm products and longer shelf life. For expanded processing to take place in the market towns of Chihuahua it will be necessary for the state to make investments in improving local infrastructure. The road network that connects many smaller towns to outside markets needs improvement. Within towns, sites for processing facilities should be identified and these sites should have guarantees of assured access to basic electricity, water and sewer services if there is private interest in developing them.

Chihuahua may also want to explore the possibility of providing matching funds to entrepreneurs who are willing to invest in processing, or other industries, in market towns. This would in a sense replicate the *maquiladora* programme, but rely on small and medium size firms that have strong supply chain links to the local community instead of multinationals.

There is a need to reinforce the public-private-academic co-operation mechanism to achieve a regional development strategy that aims at fostering growth by diversifying the economy and balancing regional development

Vulnerability to external shocks in the economy can be addressed by further taking advantage of the opportunities in other sectors. In addition to farming activities, there are clear opportunities by diversifying the economy, in particular by supporting mining, forestry and tourism activities. These are all, activities with a strong rural context; mining and forestry take place in rural areas, and the eco-tourism character of Chihuahua's mountains and deserts are clear examples. However, all these activities can be potentially harmful to the environment. Although off a small base, mining activities' impressive growth has recently led to a fivefold increase in its share of state's GDP. Mining's strong performance is being chiefly fuelled by FDI in the sector. However, the State Government could aim at linking local miners to global value chains. Mining can become an enclave in the economy, producing few jobs –as the mining process has become capital-intensive—almost no backward and forward linkages to local firms and few fiscal benefits as a result of it. One way to avoid the enclave economy and maximise the potential of mining activities is that the public sector partners with the private sector on the initiatives to develop local mining suppliers in metal-mechanics. In addition, environmental regulation should reflect the potential harm to the environment of gold, silver, lead, zinc and copper mining and enforcement of it should take a central role. Forestry requires also strong regulation, but most importantly its enforcement. Chihuahua's Ecology Direction is promoting sustainable behaviour and actively seeking to enact regulation, but lack of resources impinges on enforcement. Institutionalising the environmental payment services approach already in place and extending it to forest sustainability can yield not only economic and environmental benefits, but also social since marginal groups (e.g. ethnic minorities) can get a remuneration by conserving them. It is important that the state government ensures forestry firms that regulation that seeks sustainability is a way of protecting the environment, but also gives them long-term security on their own activities. Diversifying the economy without enforcing environmental regulation can result in unsustainable development. Tourism development can perhaps look into ways to attract FDI in the sector that can serve as a catalyst for private-sector-led promotion.

Making a more resilient regional economy depends on balancing regional development in the state. Diversification can also be achieved by exploiting opportunities in every region and thereby balancing regional development. The already constituted Council for Economic Development (CODECH) along with its regional councils (CODERs) are key to unleashing growth in lagging regions and in further boost competitiveness and address social challenges in both successful and lagging regions in the state. The strength of CODECH is in its core expertise and experience of the operations and strategic roles of a regional development agency (RDA). A strategic role, co-ordinating and facilitating co-operation across the main economic development players appears to be an appropriate role for the foreseeable future. It is not advisable that

CODECH is burdened with the role of implementation, and acting as a catalyst and facilitator are critical functions that a central and trusted organisation needs to be focused on. Stakeholders can take advantage that CODECH already is in place and that is empowered by the State's Economic Development Law to serve as a co-ordination mechanism to foster economic development. CODECH has already managed to make the public, private, academic sectors and civil society converge into regional councils. However, there is a need for further resources to be devoted to CODECH and its CODERs, as well as to upgrade competencies. The council also needs ensure that the interests of the local concerns are heard not only in the CODERs, but also in industry networks. Without a strong indigenous presence among the commanding heights of the economy and in the leading sectors especially, plans for improved networking and clustering would fail to deliver the anticipated outcomes.

Chihuahua must consider developing a document that brings the academic, private, public and social actors together on a shared vision for competitiveness and development. The vision can serve as a basis to develop an inclusive agenda for competitiveness and development that takes into account recommendations in this review and beyond and set responsible actors to carry them out on different time horizons (short, medium and long).

Municipalities also require more time to plan and implement long-run growth. Despite that Mexican legislation prevents re-election, state-level legislation can accommodate slightly longer administration periods that while preserving the national legislation, allow local governments to have greater impact on development.

There is an urgent need for water prices to reflect scarcity, to change farm management practices, and to better manage water systems by allowing local regulation and better co-ordination through a multi-level governance approach

Chihuahua is currently experiencing a severe drought that extends well into the southern United States. Climate change is expected to increase the frequency and severity of drought in the larger region of northern Mexico and the southwestern US. If it does, then the consequences for agriculture will be severe. Pressure on aquifers will increase as farms try to offset missing precipitation with increased pumping, and aquifer recharge rates will decrease. There will be major consequences for the livestock sector if forages are depleted and cattle herds have to be reduced. Competition for scarce irrigation water for crops will require new water allocation schemes if the water supply is not to be exhausted.

The lack of *local* regulation in Chihuahua threatens the sustainability of the water governance system over the long run, with tremendous externalities on other policy areas including agriculture. Given the importance of local actors, stakes and specificity in the water sector, policy makers should not avoid *complexity* by favouring traditional top-down policies but instead, find ways to maintain coherence while preserving diversity, so as to reflect the heterogeneous concerns of stakeholders on the ground. A multilevel approach integrating international, national and local actors can help diagnose inherent governance challenges in water policy making and to formulate possible policy responses.

In the case of Chihuahua, the focus should also be on avoiding subsidies so that prices reflect scarcity, and on the need for further decentralisation of water policymaking and a strong *local* regulation in the water sector. On the one hand, prices should not be

influenced by subsidies so that scarcity can influence both the crops being cultivated and the technologies employed. On the other hand, this also implies setting up legislative frameworks devoting regulatory powers to the State authorities, especially for extraction permits in order to better manage water supply and limit pollution (due to over-extraction) of aquifers. Decentralisation also means giving more prominent role to the *Technical Groundwater Committees* (COTAS) in aquifer management, strengthening the organisation and functioning of the *River Basin Councils* and their auxiliary bodies, and consolidating the governance functions and regional organisation of the CONAGUA. Besides, future reforms should involve further civil society, associations of irrigations users and *Technical Groundwater Committees* in driving for the saving of water and the technification of irrigation, formulating regulations for the distribution of surface water by catchment and by aquifer, and catalyzing financial resources for modernisation and technification of irrigation infrastructure.

For economic and environmental reasons it is vital that farm management practices in Chihuahua be improved. For these improvements to occur farmers will have to make significant investments in equipment and in altering how they produce crops and livestock. This will require access to credit and access to the technical knowledge associated with better farm management practices. The types of crops that Chihuahua is specialising on are not only crucial to determine the lower value of output per hectare, but also determine incentives to conserve water. The regulatory framework for water management and the incentives that the state provides, prevent market mechanisms from correctly reflecting water scarcity and depletion. Irrigation mainly comes from groundwater and aquifers in the state have low recharge rates. Aquifer depletion requires deeper wells and more electricity for pumping. In principle this should lead to higher costs for irrigation, but the state provides electricity subsidies that offset higher pumping costs which continue to encourage low value water uses and water-wasting technologies. Currently there are few limits on water extraction –water meters are not compulsory and are not regularly monitored, water charges are not common, water rights are not enforced, nor are restrictions on drilling. A second reason that prevents the incentives to conserve water from operating is lower financial wealth of field crop producers who may lack the money or access to credit to upgrade their irrigation system.

But ultimately policies will be subject to the state's financial capacity; with two crises leading to lower regional revenue, rising spending partly to tackle insecurity, and still low fiscal autonomy levels, the state has been relying on debt to finance development

The combination of rising spending and the challenges posed on the revenue side by the recent crisis have left the state's government with little resources to finance public investment. Indeed, the government estimates that in 2011 there will not be any fiscal space left for that purpose. As a result, the government has relied on debt financing to sustain its investment program. The state of Chihuahua stands out relative to other Mexican states in terms of how its local public finances are managed. Local revenue collections are relatively higher than in any other state and public spending is fairly open to public scrutiny. Despite such strengths, the decline in public revenues associated with the recent economic recessions, combined with structural factors that put pressure on public spending and limit investment outlays, has resulted in an increasing reliance on debt financing to carry out investment projects. While, at present, the risk that the state might not be able to uphold its debt obligations is not a concern, it could become an issue

in the medium term if actions to increase local revenues and to rationalise public spending are not put in place. The current situation has also brought attention to the need to strengthen local public finances. In particular, local revenues are deemed to be too low, with excessive reliance on federal transfers, and resources devoted to investment projects too limited.