

MOROCCO'S AERONAUTICS CLUSTER

A fast growing cluster at the doorstep of Europe

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I. Morocco: A stable gateway to Europe

A. ECONOMIC AND POLITICAL PROFILE OF MOROCCO

Morocco's is **strategically located** at the confluence of Europe, Africa, and the Arab World. Situated at the Northwestern tip of Africa it is a gateway from both the Mediterranean and Atlantic (see Figure A1 in the Appendix). It has a predominantly Muslim population of 32 million, in a territory approximately the size of France (446,550 sq km). It is known for its fertile land and is the world's largest exporter of phosphates (constitute 20% of export earnings which were 5.6 billion USD in 2011, has 75% of the world's known reserves) (Office cherifien des phosphates, 2013).

Since 2000, the Moroccan economy has been growing on average by 4.7% per annum. The GDP growth rate has almost doubled from an average of 2.6% per year from 1990 to 1999. The volatility of the growth rate has been dramatically reduced during the last decade from a 19% range (1990-1999) to a 5% amplitude (2000-2009) (Ministry of Economy and Finance of Morocco, 2013). In the last decade, the GDP has more than doubled to reach USD 100 billion in 2011 (USD 148 billion in PPP terms), or USD 3,125 per capita (USD 4,625 in PPP) (World Bank, 2013).

Under King Mohammed VI, the country has opted during the last decade for a development model characterized by increasing political pluralism and openness, economic liberalization (privatization policy and Free-Trade Agreements with the EU, US, Turkey and several Arab nations), implementation of structural reforms (labor market, justice, education, competition policy, independent monetary policy, consolidation of public finances) in addition to massive public and private investments on infrastructure and logistics projects (roads, airports, ports, public transport, sanitation, telecommunication networks, high-speed rail). These efforts were facilitated by the convergence with the European Union standards and regulations following the Advanced Status Partnership granted to Morocco (the country's exports enjoy among other privileges unrestricted

customs-free access to the EU single market and financing through the European Structural funds and the European Investment Bank loans).

For these reasons, the Arab spring has been a catalyst for further democratic change through a new Constitution introduced in 2011 that provides for the recognition of universal human rights, freedom of worship, gender equality and empowerment of elected executive (government) and legislative (parliament) branches. Following the acceptance of the new constitution, a new government has been elected in November 2011. The moderate faith-based Justice and Development Party won the elections and formed a governing coalition in January 2012. As per the constitution, the Prime Minister is the leader of the party who won most seats at the parliamentary elections.

Despite the somewhat resilient economy, growth has decelerated in 2012 to 2.7% (after 4.5% in 2011, the best performance in the region). The economy is still dependent on agriculture (15% of GDP and 40% of jobs) despite the rise of manufacturing output and manufacturing exports. Government is notoriously addressing social demands, particularly from the youth, with subsidies intended to keep basic staples and fuel for transportation at a low fixed price. Despite the social expenditures and structural reforms, young people face uncertain job prospects. Unemployment fell to 8.9% in 2011 from a high rate of 14 % in late 90s but questions remain over the quality of the jobs generated. Youth (15-24 years) has only fallen down from 19.6 (2000) to 17.6% (2010) with urban youth unemployment surpassing 31%. Morocco remains closely dependent on the European Union that absorbed 57% of its exports in 2011 and provides 59% of its imports (Ministry of Economy and Finance of Morocco, 2013).

B. MACROECONOMIC COMPETITIVENESS

Morocco's ranking for 2012 according to EIU it was 62 on the **New Global Competitiveness Index (GCI)**; 64 for Microeconomic competitiveness (MICRO) indicators; and 58 on the Macro-economic

competitiveness (MACRO) indicators (The Economist Intelligence Unit, 2013). At the Macro level, and although the country is reasonably ranked (48) on the **Monetary and Fiscal Policy (MFP)** category (48), a closer look reveals the challenge of keeping government deficit (93) and government debt under control (109). These difficulties were aggravated by the onset of the financial crisis as the government committed to a range of subsidies and social programs and had to borrow more to fulfill these needs. Despite the long history of success in keeping inflation under control (ranked #1), it has been a subject of debate whether such monetary policies are keeping the currency overvalued and thus negatively impacting the trade competitiveness. The merchandise trade deficit reached 22 % of GDP in 2008 before falling to 17 % in 2010, revealing the challenge facing Morocco in further improving the competitiveness of its exports. Government policies, a fixed exchange rate –the dirham is pegged to a basket (80% Euro, 20% USD), and a decline in the share of private investment in manufacturing are all possible factors contributing to the erosion of export competitiveness (The Economist Intelligence Unit, 2013).

On the category of **Social Infrastructure and Political Institution (SIPI)**, Morocco was ranked 61; however, the details reveal a challenge in the quality of education (ranked 109) and the secondary enrollment (110) combined with needed improvements in skill mismatch and weak vocational education. Despite the reasonable ranking for political institutions (57), the independence of the judicial system (88), and corruption control (70) rankings remain a matter of concern (The Economist Intelligence Unit, 2013).

Using the national poverty line (USD 1.5 per day) as a standard of measure, the rate of poverty had fallen from 16.3 % in 1999 to approximately 9% currently (but higher in rural areas at 14.4%) (Moroccan National Bureau of Statistics, 2013). In order to bring down poverty, the government has established the National Initiative for Human Development (INDH), which makes available macro

credit to provide access to basic social services and also promotes employment for the youth and women. Morocco ranks 130th out of 187 countries on the 2011 **Human Development Index (HDI)** and 17th in the MENA region (United Nations Development Program, 2013). The country's index improved from 0.435 (1990), 0.507 (2000), 0.579 (2010), and to 0.582 in 2011. As an example of health and education indicators: life expectancy at birth has improved from 64.1 years in 1990 to 72.2 years in 2011; expected years of schooling have improved from 6.6 years in 1990 to 10.3 years in 2011. Despite this constant improvement in the past two decades, Morocco still lags the comparable countries such as Egypt and Tunisia. This is mainly due to the disparity in access to health and education between the urban and rural areas. See table A.1 in the Appendix for a comparison between Morocco's peers.

C. MICROECONOMIC COMPETITIVENESS AND THE NATIONAL BUSINESS ENVIRONMENT

According to (World Economic Forum, 2012), Morocco was ranked 64 on the overall micro competitiveness. While the ranking of the national business environment stood at 61, the ranking on the category of Company Operations & Strategy was poor (81), due mainly to the weak capacity of firms to innovate and internationalize. Morocco ranks 94th out of 183 countries (up from 115th in 2011) (World Bank, 2011). This represents an improvement of its ranking by 21 places, and Morocco was named the world's best reformer in the World Bank's 2012 Doing Business Report. The rising FDIs was a testimony to this change. However in 2013, the country ranked 97th in the world, falling 4 places because of the political transition. Morocco made a remarkable improvement in the category of starting a business (up to 56 from 94), bringing the number of procedures down to 6 and the number of days to start a business down to 12 – all of which are numbers comparable to OECD countries. However, improvements are needed in areas such as: registering property (163), paying taxes (110),

protecting investors (100), and getting credit (104). The country diamond below captures the salient features of the country's strengths and weaknesses (World Bank, 2011).

To exploit its geographical location close to the world's largest economy (EU) and the fast growing Africa, Morocco has to address the quality of education and skill mismatch; labor law rigidity, and the acceleration of the diversification of the economy to include higher added-value clusters.

Factor Conditions: In addition to the endowment of climate and geography, the factor conditions have considerably improved by the recent achievements in infrastructure and logistics. The sophisticated seaport of Tangier (ranked 12th in the world and is the largest container port in the Mediterranean and Africa) (Tanger Med Port Authority, 2013), the first high speed railway in Africa, a network of highways that span 1500 km covering the kingdom, and Casablanca Airport (#1 airline hub between Europe and Africa) contribute to the availability of a reliable infrastructure. Morocco has the fastest internet connection in Africa (broadband). However, the challenges are greatly in the quality of education, the skill mismatch, and the weak innovation infrastructure (ranked 116). Still, the country has an advantage of being French the first language, so it can have a better approach to its trade relations with France. The government and company expenditure on R&D are low¹. The access to finance for SME's is another challenge, as banks require collateral since they lack reliable accounts.

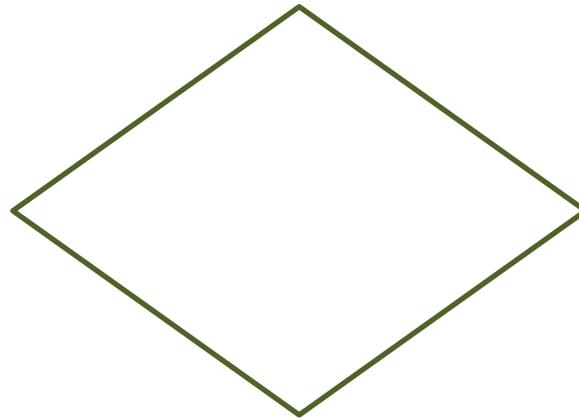
¹ 0.6% of GDP only for the government (The World Bank, 2006), and company expenditure on R&D was ranked (120) in the (World Economic Forum, 2012)

Figure 1: Morocco Country Diamond

- + Compared to the region, a promising political stability
- + Clear National Development Plan
- + Trade Treaties (FTAs with US, EU, Turkey, and others)
- + Free Trade Zones
- + No restriction on money transfer

- # 97 Over all Rank in Doing Business Report
- #163 in registering property
- # 104 in getting credit
- # 100 in protecting investors
- # 88 in enforcing contracts
- # 109 Labor-employer relationship
 - # 89 IP Protection
 - Majority of companies lack scale to compete internationally
 - Too dependent on Europe (65% of exports & 80% of remittance)

Context for Strategy & Rivalry



Factor conditions

- + Location (climate & geography)
- + Proximity to markets (north & south)
- + 14 Km from Europe
- + Infrastructure (highways, rail)
- + Sophisticated sea port (Tangiers)

- Higher Education & Training (Skill mismatch)
- Access to finance (going mainly to real estate not SMEs)
- Capital Markets
- Weak innovation infrastructure & low R&D

Related & Supporting activities

- + Several established classic clusters (Chemicals- phosphate, agriculture, tourism, textiles)
- + FDI are increasing in the industrial sector (e.g. Automotive- Renault)
- Limited collaboration among clusters
- Slow development of high tech/ high productivity clusters

Demand Conditions

- + Large population (> 32 Mn) and local markets are not saturated
- + Close to a sophisticated and wealthy market (Europe)
- + EU advanced status (access to the single market)
- + Close to a growing markets (Sub-Saharan Africa), that looks up to Morocco
 - Major exports are still in basic
 - Local markets are not sophisticated (75% poverty in rural areas)
 - Problems in expanding East (The Maghrib region; issues with Algeria)

Context for National Strategy and Rivalry: The new government has a clear economic development plan, which relies on improving the competitiveness of the business environment to support its national industrial strategy “Emergence”. The establishment of Free Trade Zones, the trade treaties (44), and the absence of restrictions on foreign currency money transfers have contributed positively to the context for national strategy and rivalry. On the other hand, the tariff level with countries that do not have a treaty is still a challenge (ranked 91), and other aspects of the business environment still represent a challenge for investors interested in high-added value clusters such as the aeronautics and others. Furthermore, the majority of companies lack the scale to compete internationally, as almost 90% of the companies are SMEs. Other important issues that are hindering the competitiveness are the rigid labor practices as labor-employer relations are ranked 109.

Demand Conditions: With globalization, the sophistication of the local demand of the rather large population of Morocco is growing, and markets are still far away from being saturated (+7.4% household consumption in 2011) (Moroccan National Bureau of Statistics, 2013). Furthermore, Morocco has a great potential in improving demand conditions by capitalizing on its proximity to one of the largest and most sophisticated markets of the world. With the EU free trade agreements and its low cost labor, Morocco can be very competitive in addressing the demand for some products, if it could expand the high-added clusters (e.g. aeronautics, automotive, IT and electronics). African markets represent further growth potential for Morocco to its already established presence in the banking, construction, and mining sectors in West Africa (Attijariwafa bank, BMCE bank, SNI, Addoha group).

Related and Supporting Industries: The country has a small number of well-established classic clusters, such as tourism, apparel, phosphate and textile. The opportunities for collaboration are increasing with the development, since 2005, of new high value-added clusters such as the IT

offshoring. However the potential for improved competitiveness through increased related and supporting activities is expected with the increased flow of FDI into emerging industrial clusters (other than tourism and real estate) such as the aeronautics and automotive clusters.

D. COMPOSITION OF THE ECONOMY BY CLUSTER

Morocco has experienced an intense change in its economical structure in the last 10 years, driven by services and by manufacturing of high technology goods. The government has build up a long-term strategy based on the competitive advantages provided by some of these emerging industries. This has sketched the National Pact for industrial Emergence that covers the following sectors: Offshoring, Automobile, Aeronautics, Electronics, Textile & Leather, and the Food Industry (Government of Morocco, 2012). The Moroccan aeronautic industry stands out as an emerging industry with a strong growth in exports (a jump in a decade of 88 times the value of exports from 2000, achieving a 2% share of the Nation’s value of exports - USD 521 MM by 2010)².

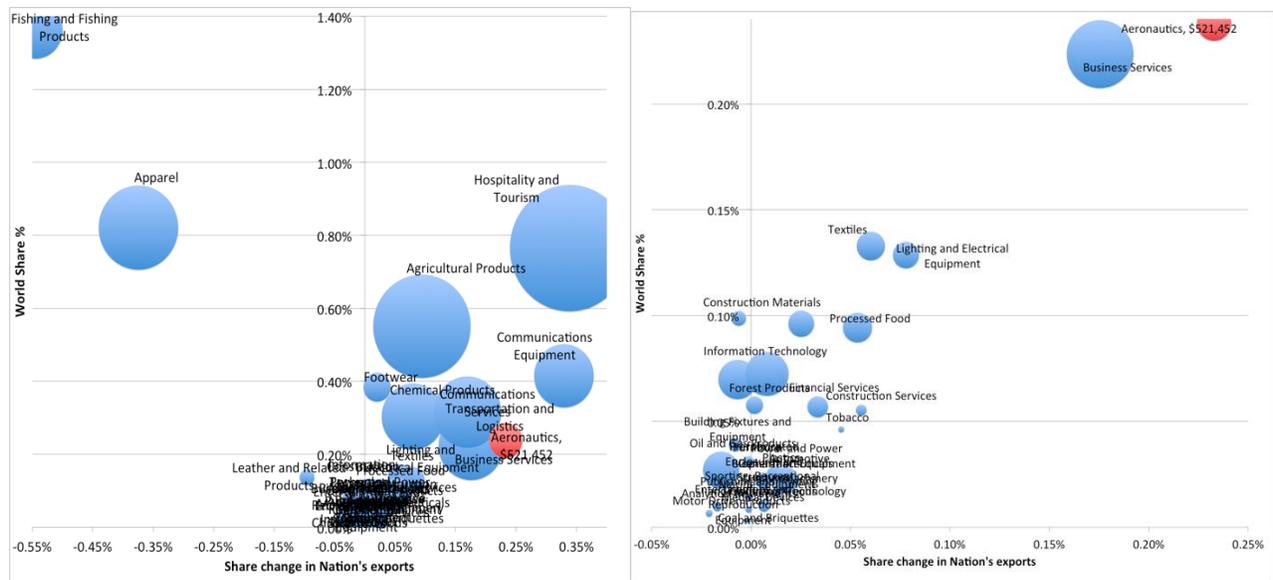


Figure 2a & 2b (zoom): Relative performance of the Aeronautics cluster in the Moroccan Economy.

² The chart has relied on the 2010 data from (Institute for Strategy and Competitiveness, 2010). For the case of the Aeronautic industry we have used the government source for 2010 and 2000 data from (United Nations, 2013), which is more representative of the recent growth that this industry has achieved, since it aggregates all the products that have come out of this cluster.

E. KEY COUNTRY COMPETITIVENESS ISSUES

The Moroccan government is taking serious steps to expand its industrial and services sectors through increased investment: in 2009 it launched 22 industrial platforms and free trade zones. The government's objective is to generate 1.6% in annual GDP growth and 22,000 industrial new jobs to enhance its unemployment, increase FDI, knowledge transfer, boost exports, and enhance the budget. In order for this expansion to occur, as part of the emergence plan, there is a serious effort to enhance the investment climate to attract foreign investors. Moreover, the focus on enhancing and supporting SMEs through national programs is important in the creation of future potential suppliers and local companies for their clusters of focus. A network of dedicated training institutes is being set up by the Department of Employment and Vocational Training to meet the needs of automotive suppliers, aeronautics assemblers, and IT specialists. The fact that the main investors and trading partners are from Europe, is greatly enhanced by the French speaking workforce and their cultural proximity. On the short-run, the competitive wages from Morocco (as compared to its neighbors and Europe), can further enhance the competitiveness; however long-term competitiveness can only be achieved if there is a sustained knowledge transfer process from foreign investors that can help to build the skill-set needs. Furthermore, private public partnerships created with specific targets and measures will significantly improve their sectors of interest.

II. Aeronautics in Morocco: A promising cluster

A. PROFILE OF THE GLOBAL AERONAUTICS INDUSTRY

The global aeronautics industry is comprised of a worldwide network of manufacturers, vendors and suppliers, which are organized under a supply chain structure (see Figure 3). There is a concentrated group of Original Equipment Manufacturers (OEMs), represented by the traditional firms of the civil aircraft market such as Airbus, Boeing, Bombardier and Embraer that are in charge of product

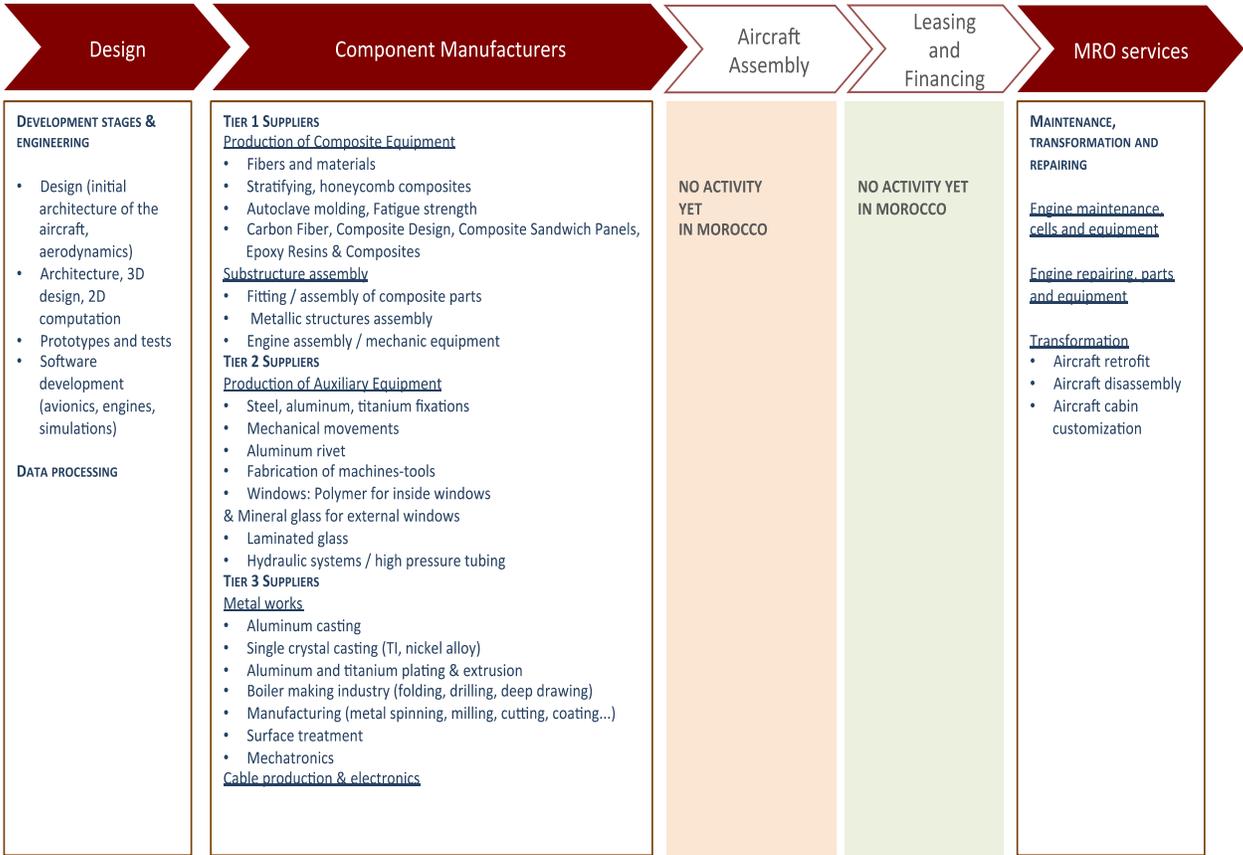
assembly and integration. OEMs outsource different components of the aircraft to a range of suppliers that are hierarchically divided under a three-level approach. For instance, Tier 1 suppliers (in charge of components like engines, flight control systems, fuel system), rely on Tier 2 & 3 suppliers for the production of minor equipment (mechatronics, materials, cables and aftermarket components & services)(PriceWaterhouse Coopers, 2009). This staged approach has helped OEMs reduce their costs and channel the different manufacturing activities to specialized providers. It is the case in some low-cost countries, in particular for Morocco, that prime integrators (OEMs) establish subsidiaries that can play the role of Tier 1 firms. Finally, the last stage in the supply chain is Maintenance, Repair and Overhaul (MRO) services, and that is influenced by the airlines' activities. Moroccan firms (mostly subsidiaries of European & North American aerospace companies) are diversified among various stages of the supply chain although the final, technology-intensive, aircraft assembly takes place in more mature cluster locations in Europe and North America.

Demand for new aircrafts is sensitive to cyclical fluctuations of economic growth. Market value is expected to reach USD 4,470 billion by 2030, accounting for 34,000 new planes, of which 72% will be supplied to emerging countries(Boeing, 2012). Another driver is the liberalization of the air transport market³. Airbus set a vision for 2020, with the targets of diverting 40% of its sourcing and 20% of its employees outside of Europe (Ecorys Netherlands B.V., 2009). The main purpose is to better compete in emerging markets by establishing local manufacturing facilities (to benefit from competitive wages, better control of supply chain, and reduce overall costs) (PriceWaterhouse Coopers, 2009). This has enabled emerging countries to enter the aircraft manufacturing business. The arrival of these new manufacturers is transforming the structure of the market, and changing the landscape of the existing duopoly of Airbus (EADS)/Boeing (Direction des Etudes et des Prévisions

³ Such is the case of the Open Skies agreement between the EU and Morocco which for the EU was the first agreement of its kind with a non-European country, and that had the outcome of increasing international traffic by 20% per annum during the period of 2003 and 2007 (Schlumberger & Weisskopf, 2012)

Financières, Ministère de L'Economie et des Finances, 2012). Furthermore, worldwide OEMs have shifted towards a supply chain model with stronger reliance on Tier 1 as integrators of fewer and more complete work packages. This has the purpose of reducing the number of suppliers and associated costs⁴. Suppliers are now challenged to sustain leadership. They need to pursue continuous innovation to increase productivity while maintaining quality; be able to adapt quickly to market demand and structural changes of the supply chain; and achieve economies of scale to reduce cost. One final technological challenge for suppliers is to come up with designs for more fuel-efficient airplanes that cope with the rise in fuel prices, and comply with regulations on greenhouse gas emissions (European Commission, 2013).

Figure 3: Value Chain of the Aircraft Manufacturing Industry



⁴ For instance, Embraer changed their system integration strategy for their EMB170/190 aircraft, to reduce the total amount of suppliers from 350 (4 were risk sharing) to 38 (16 were risk sharing) (Clearwater, 2011)

B. THE EMERGENCE OF THE AERONAUTICS CLUSTER

Royal Air Maroc/Pioneering maintenance activities: The aeronautics industrial history started in Morocco with the creation of the national carrier Royal Air Maroc (RAM) in 1957. The state-owned company developed soon after its first aircraft maintenance activities at the Casablanca International Airport. This would soon become the embryo of a future aeronautics industry. By 1998, the US Federal Aviation Administration delivers RAM's maintenance operations the Federal Aviation Regulations part 145 certification that governs repair station activities, and the personnel working in repair stations. The US strict federal accreditation brings immediate acknowledgment of the Moroccan airline expertise and positions Casablanca as an established worldwide hub for aircraft maintenance activities.

Maroc Aviation: The other historical protagonist is Maroc Aviation, a subsidiary of the former Aerospatiale (a French aerospace manufacturer now part of Thales), present in Morocco since 1951 to carry out maintenance of the instrumentation devices for the Moroccan Royal Air Force Hercules C130 (Lockheed military transport aircraft) and Super Puma helicopters. Since 1993, the company is owned by EADS Sogerma and as such operates as an equipment supplier to Airbus. It also acts a subcontractor to other aircraft manufacturers.

Snecma Morocco Engine Services: Snecma Morocco Engine Services (SMES) is founded in 1999 as a subsidiary owned 51% by Snecma and 49% by Royal Air Maroc. SMES is specialized in the maintenance and repair of commercial aircraft engines (CFM 56 engines powering the Boeing 737). SMES inherited the maintenance of engines from RAM.

With RAM, SMES and Maroc Aviation, Morocco has gained a technical expertise and internationally recognized know-how. The national aviation industrial cluster became compliant with the most stringent European and American standards of quality for both civil and military operations.

Morocco is now ready to transform itself into a fast growing supply and manufacturing base for the world's major OEMs. In 2001, only 10 companies were active in the Moroccan Aeronautics nascent cluster. Ten years later, there are more than 100 SMEs employing more than 10,000 people (from 300 workers in 2001) with total sales of over USD 1 billion (CAGR of 20%) (Moroccan Agency of Investment of Development (AMDI), 2013). Following the government's new industrial strategy aiming at developing an aeronautics cluster propelled by the endowments of the country (geographical advantage for Europe, language skills for the French aerospace players); pro-active public policies; and dedicated IFCs (GIMAS, Morocco's aerospace trade group). Training a skilled workforce has been a priority from the early 2000s and incentives are granted to investors in the aerospace sector (industrial parks in free-trade zones with minimal red tape & fiscal as well as direct financial benefits). Most companies operate today in higher-value component manufacturing, engineering and services. French companies represent 85% of the new investments in the cluster with more than EUR 400 million earmarked in the past 5 years only, according to the Moroccan ministry of industry. Following EADS-Airbus & Boeing, Bombardier is investing USD 200 million with a new manufacturing facility producing flight controls for the *CRJ* Series aircraft and other structures. Bombardier, the world's third largest OEM (after Airbus and Boeing), has chosen Morocco to establish its fifth worldwide manufacturing base after Canada, the USA, Mexico and Ireland. Morocco was selected for its proximity to Europe but also for the depth and rapid growth of the current cluster. Bombardier also cites the close linkages to established suppliers in Casablanca, the skilled available workforce, the dedicated logistics and real estate infrastructure and the transparent industrial strategy of the government. Turkey and Tunisia were both considered but later dismissed because of the lack of a trained competitive workforce, for language barriers (in the case of Turkey) and for the absence of a cluster (Tunisia).

The Moroccan aeronautics cluster has established itself in higher added-value manufacturing operations and services and competes globally beyond the competitive cost factor (skilled labor force, logistics, quality infrastructure, industrial real estate, administrative simplicity).

Figure 4: History of the Aeronautics cluster in Morocco (GIMAS, 2011)

1960-1999: MAINTENANCE ACTIVITIES

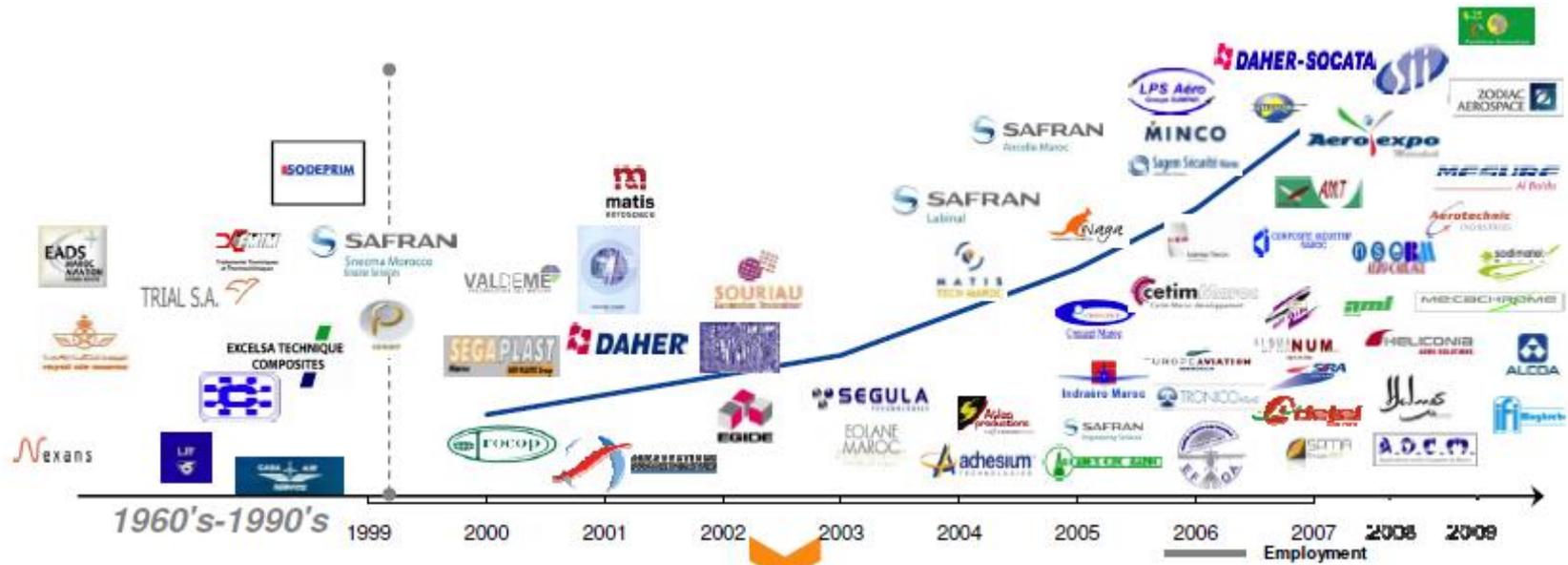
- Maintenance facility linked to the national carrier Royal Air Maroc
- Long-established Pool of qualified workforce and ad-hoc Know-how in aircraft maintenance processes

1999-2001: INTERNATIONAL PLAYERS

- EADS, Boeing and Safran investments establish Morocco as an emerging aeronautics industrial base for aircraft-carriers

SINCE 2002: THE EMERGENCE OF THE CLUSTER

- New actors are attracted to Morocco
- Foray into more sophisticated activities along the value chain
- Industrial strategy and state support



105 international companies

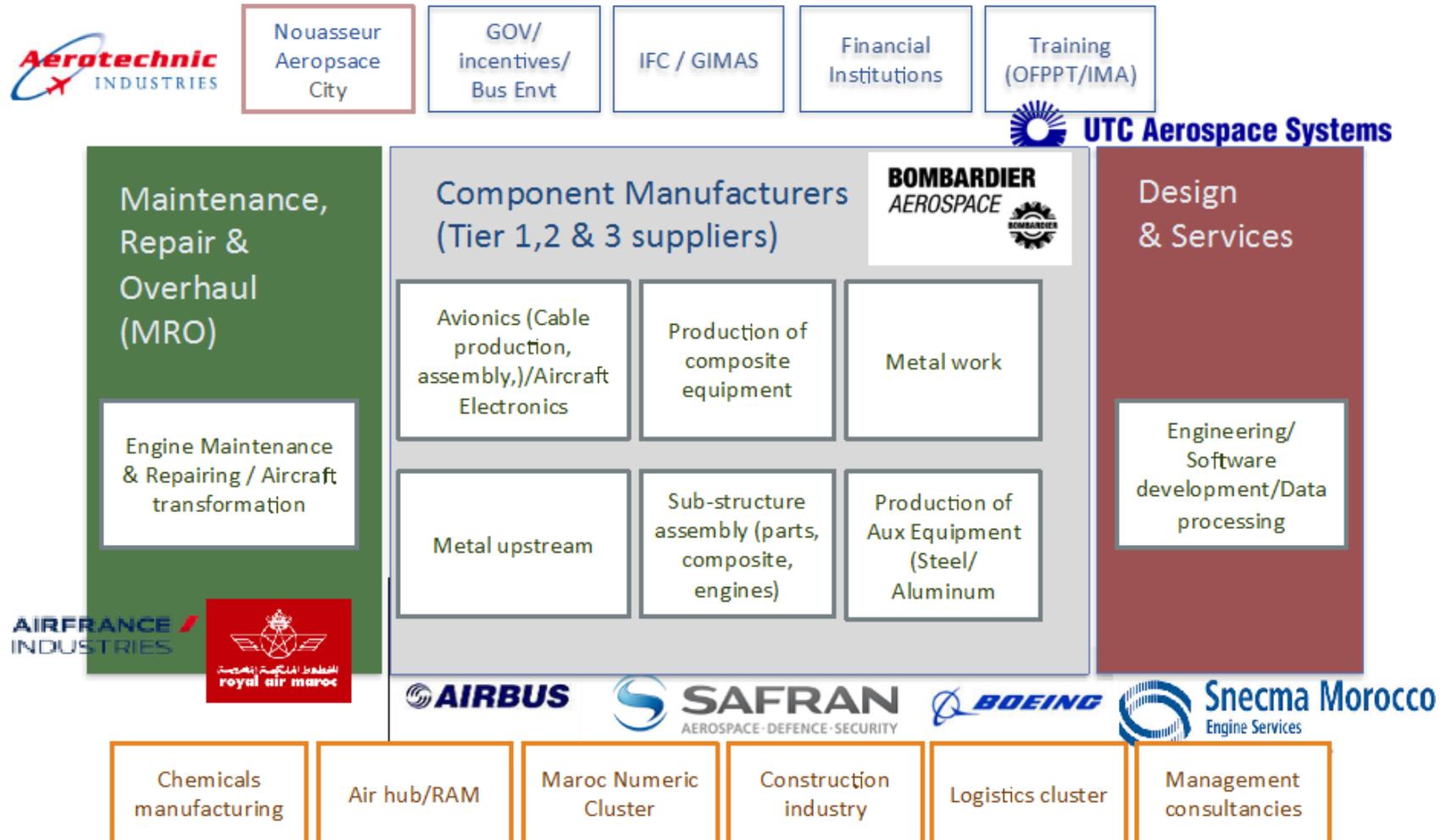
Anchor companies are Safran, EADS, Bombardier & Boeing

USD 1 billion in revenues in 2012 (CAGR 20%)

10,000 employees

C. MAP OF THE AERONAUTICS CLUSTER IN MOROCCO

Figure 5: Map of the Aeronautic Cluster in Morocco



The government of Morocco has started a decade ago aggressively promoting the country as an aeronautics industrial base, which seemed at least very ambitious or rather utopic at the time. Thanks to an FDI from Boeing and a French electrical wiring company (Labinal) in early 2000 has helped bring later on the necessary capital, technology, skill-building capacity and market access that attracted recently United Technologies and Bombardier.

The sector now employs almost 10,000 workers who earn about 15% more than the average monthly wage (which remains relatively low for Western standards at USD 320/month). Wiring & cable production accounts for 51% of the aeronautics cluster exports, followed by the fast-growing manufacturing of aircraft components (19%) and maintenance, repair & overhaul activities (12%).

90% of the 100+ companies operating in the cluster are subsidiaries of French companies or have a close partnership with the French aeronautics cluster.

Bombardier recent USD 200 million investment has established Morocco as a global player with the three major OEMs maintaining manufacturing operations.

D. PROFILE OF THE COMPANIES IN MOROCCO

SAFRAN: Safran is a leading international high-technology group with three core businesses: aerospace, defence and security. Operating worldwide, the Group has 62,500 employees and generated sales of 13.6 billion euros in 2012. It is the world leader in engines for mainline commercial jets (partnership with GE). In Morocco, Safran has 2,700 employees, with more than 70% women, and accounting for nearly one-fourth of the aerospace industry jobs in the country. It has been operating in Morocco since 1999. The Group's industrial operations have also contributed to the emergence of a local supply chain. For this cluster, Safran has six industrial subsidiaries working on aircraft engine maintenance (SMES, a joint venture between Snecma and Royal Air Maroc),

engineering (Safran Engineering Services), electrical wiring (Matis Aerospace⁵ and Labinal Maroc), engine nacelles (Aircelle Maroc) and ID cards (Morpho).

EADS: EADS Socata work on subassemblies for the TBM 850 turboprop single and for Socata's aerostructure business. This includes elements for the Eurocopter AS 350/355 and Dassault Falcon 7X. EADS Sogerma is a 100% subsidiary of EADS. With an experience of over 80 years in the aircraft manufacturing trades. EADS Maroc Aviation in Casablanca is active in aircraft seat production and sub-assembly, as well as aeronautical wiring activities.

BOEING: Boeing is already a shareholder in MATIS, a Moroccan company specializing in aerospace wiring and harness products. The US aerospace company has also developed strong relationships with many of the 100 other aerospace-related companies in Morocco.

UNITED TECHNOLOGIES: UTC Aerospace Systems inaugurated last year a new Propeller Systems facility in Casablanca. The new subsidiary, Ratier-Figeac Maroc, (RFM) is UTC Aerospace Systems' first facility in Africa. RFM was created in January 2011 as part of an ongoing Propeller Systems' cost reduction strategy. During the facility's construction, RFM technicians trained at the IMA ("Institut des Metiers de l'Aeronautique") – the Moroccan Institute specialized in training in aeronautical activities. The RFM facility covers 46,000 square feet, and is specialized in the assembly of cockpit controls and cabin equipment.

BOMBARDIER: Bombardier of Canada, the world's third largest aircraft manufacturer, is investing USD 200 million in new manufacturing facilities in Morocco. It started in February 2013 a transitional manufacturing facility in the Casablanca Aerospace City and is currently producing simple structures including flight controls for the *CRJ* Series aircraft. By year-end, the facility is expected to employ approximately 100 fully trained aircraft assemblers.

⁵ Matis Aerospace is a joint venture between Labinal, Boeing and Royal Air Maroc

E. IDENTIFICATION OF KEY COMPETING CLUSTERS IN OTHER COUNTRIES OVERVIEW OF SIMILARITIES/DIFFERENCES WITH THE CHOSEN CLUSTER

The last 15 years the duopoly of Airbus and Boeing has been challenged by the rise of Bombardier (Canada) and Embraer (Brazil). These prime integrators have outsourced part of their manufacturing into low-cost countries, driven mainly by their low-wages (Ecorys Netherlands B.V., 2009). Still, emerging markets represent only a small portion of the aerospace industry's sourcing needs, but it is expected that they will become a major source of demand over the next two decades (Bedier, Vancauwenberghe, & van Sintern, 2008). The following comparison is focused on this segment of low-cost countries, in particular to those that are supplying components to the major European integrators, which is the scope of the Moroccan cluster. All these countries (with the exception of Tunisia) have signed liberalization agreements such as the Open Skies treaty.

Tunisia: The Tunisian aeronautic cluster has achieved international presence in 55 countries, employing 4,500 people and exporting a total volume of USD 119 Million by 2010 (United Nations, 2013), mainly to the EU. The focus of suppliers is in electronics components ranging from Tier 1 to Tier 3 (Foreign Investment Promotion Agency of Tunisia, 2011). Even though it has similarities to Morocco (location advantage, competitive wages⁶, and supply to EU integrators), this cluster has not been able to attract a large OEM integrator (such as Boeing, Airbus and Bombardier); and also lags behind Morocco in volume of exports (Morocco exports five times more). In addition, Tunisia is the only competitor on this list that hasn't liberalized its commercial aviation market.

Turkey: Turkey's location is strategic for MRO, cargo services and general manufacturing for large civil aircraft, private jets, and composite materials. However, the aeronautic cluster remains specialized mostly on defense (Turkish Aerospace industries, 2013). Most activity is driven by the

⁶ In proportions ranging from 1 to 5 compared to European countries.

State-owned company Turkish Aerospace Industries, Inc. (TAI), originally formed as a US-Turkish partnership in 1984 for the co-production of military aircrafts in Turkey. Level of exports reached USD 408 Million in 2010 (United Nations, 2013)

Malaysia: The government is actively supporting the cluster (tax incentives, training programs) to increase its presence globally. It is one of the top ten locations for MRO investments and has attracted manufacturing investments from OEMs like Airbus, Boeing, Hexcel and Rolls-Royce. It can further rely on a skilled English-speaking workforce. Total exports reached USD 723 Million in 2010(United Nations, 2013).

F. CLUSTER DIAMOND IN MOROCCO

Factor conditions: At the heart of Morocco's efforts to improve the enabling conditions for this cluster, is the creation of "Nouasseur Aerospace City" (NAC), an integrated industrial platform located right next to the Casablanca international airport that combines the benefits of a free zone and a special development zone. An aeronautics company choosing to locate in NAC benefits from: A flexible and customized real estate; The "Institut des Métiers de l'Aéronautique", a vocational training center created for the aeronautics industry; Access to services ranging from MRO to general business services for the aeronautics industry; Simplified administrative processes: Given the average performance of the Moroccan administration in the different "doing business" rankings, Morocco has decided to streamline key administrative processes (customs, visa, tax...) for companies locating in NAC. This was made possible by increasing the authority given to the operator of NAC. NAC operator is a one-stop shop for all administrative procedures and its prerogatives range from licensing to management of onsite utilities; Tax advantages (no corporate tax for the first 5 years and 8.75% for the following 20 years, no VAT, no custom duties) and financial support for training local technicians.

Important improvements are underway, such as a dedicated road for heavy trucks going from the airport area (where NAC is located) to Casablanca port. It also includes the development of an integrated railway transportation including freight – passengers between the airport area and Casablanca port. Last but not least, Morocco plans to expand the port of Casablanca. Regarding education, Morocco has increased the intake of specialized engineering schools and vocational training programs (with the aim to train 15,000 employees), as well as the creation of different masters programs partnering local universities (Rabat University and local engineering schools) and global firms from the aeronautics industry (Thales and Safran Engineering Services). Despite the efforts to upgrade the skills of aeronautics professionals, Morocco is handicapped by a weak general education system. In addition, R&D is absent from this picture.

Context for Firm Strategy and Rivalry: Morocco has lifted all restrictions on foreign capital investments for aeronautics companies locating in NAC, as long as they are export oriented. As a result, more than 90% of the ownership of the aeronautics companies in Morocco is foreign, including leading companies such as Safran or Bombardier. The cluster has already reached a significant size with more than 100 companies, most of them concentrated around Casablanca. This in turn creates positive externalities in terms of recruiting, access to suppliers and exchange of information. However, a majority of the companies are subsidiaries or linked to French giants EADS and Safran (85% of aeronautics companies in Morocco are French). It is normal that Morocco capitalizes first on its ties with France. However over the long run, it will be beneficial to the overall business environment if firms from other countries choose Morocco as a manufacturing location (such as it is starting to happen with Bombardier). Some North American firms use Morocco as a base to supply European OEMs and tier 1 suppliers, therefore increasing the pressure on existing companies which ultimately leads to more innovation and increased competitiveness.

Demand conditions: The local market is too small to sustain a demand for aeronautics and allow Morocco to further move upward in the value chain, besides a maintenance demand for the local carrier Royal Air Maroc. Aeronautics companies in Morocco are export oriented and focus primarily on the French and European markets, leveraging the geographical and cultural proximity of Morocco to France and Europe. 85% of the aeronautics exports of Morocco are going to France and only 10% to the USA(Caisse de Dépôt et de Gestion, 2013.). The aeronautics cluster demand is therefore mainly driven by the French demand, which is also very tied to European demand (through the European consortium EADS - mother company of Airbus-, led by France and Germany). The suppliers moving to Morocco are among the most sophisticated suppliers globally as their products are ultimately assembled by these leading OEMs. The European aerospace and defense demand amounted in 2011 to €171.5 billion, of which €70 billion was in civil aeronautics. The downside of such a situation is that the demand is not diversified enough and relies mostly on the European market. It is only recently that North American companies started considering Morocco: Bombardier's announcement to invest in Morocco is promising but North American exports are still a small proportion of Morocco's total aeronautics exports.

Related and Supporting industries: The aeronautics cluster is supported by the existence of a growing logistics cluster in Morocco and a thriving automotive cluster. The development of the logistics cluster has allowed the fast development of the transportation infrastructure, which enables aeronautics companies to quickly ship their goods to Europe. Morocco has 2 major ports (among the biggest in Africa) in Casablanca and Tangiers and has an international airport in Casablanca, which is the number 1 hub between Europe and Africa. Regarding the automotive cluster, it relates to aeronautics as there are similarities in the manufacturing process. Therefore, there are positive externalities in terms of recruiting but also in applied R&D (e.g. improving the manufacturing

process). The automotive cluster has witnessed a boom since 2007 with the decision of Renault to produce up to 400,000 cars per year in Morocco. Still, what is missing in Morocco is a strong high tech and electronics cluster. Several aeronautics companies in Morocco are in the avionics segment, which corresponds to the electronics systems used in aircrafts, and which would benefit from a close and thriving electronics cluster.

Figure 6: Diamond of the Morocco's Aeronautic Cluster



G. INSTITUTIONS FOR COLLABORATION (IFCs)

The Moroccan aeronautics IFC is GIMAS, which stands for “Groupement des Industries Marocaines Aeronautiques et Spatiales”. Its focus is mostly on developing the overall strategy for the sector and representing the interests of aeronautics companies with the Moroccan government and foreign governments. The management of GIMAS is comprised of senior executives from aeronautics companies established in Morocco. However, GIMAS has limited human (only 2 full time employees) and financial resources, which limit its reach and its capacity to support the industry. GIMAS also works in coordination with AMDI, the national investment promotion agency, to attract aeronautics companies to Morocco. AMDI has more resources (about 60 full time employees) but its support to GIMAS is limited to attracting aeronautics investment to Morocco and AMDI’s overall mandate is broader than just aeronautics.

III. Taking Morocco’s Aeronautics cluster to the next level

A. COUNTRY LEVEL RECOMMENDATIONS

Priority 1: Maintain macroeconomic stability: A stable macroeconomic environment is a prerequisite for effective improvements to the business environment. Despite Morocco’s strong macroeconomic fundamentals, the 2008 crisis and the Arab Spring have negatively impacted the fiscal situation and current account. The growing public deficit and the current account deficit signal the risk of a currency crisis, especially that public debt is now expected to exceed 60%. One first measure is to significantly review the subsidies system that has been driving a major part of the deficit. Second, the exchange rate system (80% peg to Euro) should also be revisited with the intention to correct overvaluation of the currency that might have affected the trade competitiveness.

Priority 2: Enhance Productivity by improving the education system: With the objective to improve long-term productivity, Morocco should strengthen the science curriculum in primary and secondary education, and should improve the quality of teachers by making a career in teaching more attractive. A strong education system would be a foundation for effective special programs to train sector-specific technicians and engineers (e.g. the aeronautics sector), which should be encouraged.

Priority 3: Enhance Competitiveness by improving the investment climate: Morocco should continue working on its investment climate; in particular, the upgrading the robustness of the the judiciary system and protecting investors. Morocco should work on improving commercial justice delays and promote alternative dispute resolution modes e.g. arbitration and mediation.

Priority 4: Develop SMEs and improve access to capital: SMEs are an engine for growth, and they should be supported by special programs (Capacity Building, credit bureaus, rating agencies, etc.). Banks should be encouraged to widen their branch networks and to diversify their products, including the introduction of alternative modes of financing, geared towards SMEs and desired by the local business communities.

B. CLUSTER LEVEL RECOMMENDATIONS

Priority 1: Diversify mix of companies: In order to create more competition, it would be beneficial to attract a firms from a broader range of countries. For example, by persuading the settlement of more North American suppliers, the existing supplier base (of mostly French-subidiaries) will have to confront a more serious level of competition. Thus, stimulating innovation and diversifying the risks in case for example Airbus loses market share. GIMAS, together with AMDI, should therefore increase their reach to North American companies and initiate a major roadshow in North America.

Priority 2: Develop an electronics cluster: As mentioned previously, there would be enormous benefits from encouraging collaboration between the aeronautics sector and the nascent electronics

cluster. The industrial development plan (Emergence) has also chosen the electronics cluster as a priority. Major players in the electronics industry have chosen to outsource some of their operations in Morocco. So this self-reinforcing process should be sustained to create the necessary synergies needed for the aeronautics industry.

Priority 3: Strengthen GIMAS: GIMAS's role should be enhanced to include more prerogatives such as data collection to help benchmark the aeronautics cluster, increase transparency and support its companies in making informed decisions. In addition, GIMAS should be empowered to collaborate with other national and international clusters with the objective of sharing best practices. In order to do so, the human and financial resources of GIMAS should be strengthened. A financial contribution should be asked from companies in the cluster and a recruiting effort should be initiated to strengthen the organization of GIMAS.

Priority 4: Invest in R&D: R&D has so far not been a focus of the cluster. However, in order to make the cluster more competitive and make it harder for other countries such as Tunisia to replicate the aeronautics cluster, Morocco should invest in R&D (starting with applied R&D) and incentivize entrepreneurship. Morocco should therefore strongly support the development of research institutes in partnership with foreign companies and universities. Public funding should be provided with transparency on the outcomes. Commercialization of innovations should be made through start-ups incubated by these research institutes, similar to what was done in the watchmaking and microelectronics industry in Switzerland.

IV. References

- Bedier, C., Vancauwenberghe, M., & van Sintern, W. (2008). The growing role of emerging markets in aerospace. *The McKinsey Quarterly, 2008*, (Issue: 2), 114.
- Boeing. (2012). *Current market outlook: 2012 - 2031* Boeing.
- Caisse de Dépôt et de Gestion. (2013.). *Interview with the chief economist of the CDG*
- Direction des Etudes et des Prévisions Financières, Ministère de L'Economie et des Finances. (2012). *Le secteur aéronautique marocain face aux nouvelles mutations mondiales*
- Ecorys Netherlands B.V. (2009). *Competitiveness of the EU aerospace industry with focus on: Aeronautics industry* European Commission, Directorate-General Enterprise & Industry.
- European Commission. (2013). *European commission homepage: Emission regulation for aviation*. Retrieved 05/04, 2013, from http://ec.europa.eu/clima/policies/transport/aviation/index_en.htm
- Foreign Investment Promotion Agency of Tunisia. (2011). *Tunisia: a performing aerospace supply chain*
- GIMAS. (2011). *A competitive aeronautical Base at europe's door step*
- Government of Morocco. (2012). *National pact for industrial emergence (2009-2015)*., 2013, from <http://www.emergence.gov.ma/>
- Ministry of Economy and Finance of Morocco. (2013). *Website of the **Ministry of economy and finance of morocco***., 2013, from http://www.finances.gov.ma/portal/page?_pageid=93,1&_dad=portal&_schema=PORTAL
- Moroccan Agency of Investment of Development (AMDI). (2013). *Telephone interview with AMDI*
- Moroccan National Bureau of Statistics. (2013). *Website of the haut commissariat au plan (moroccan national bureau of statistic)*., 2013, from <http://www.hcp.ma>
- Office cherifien des phosphates. (2013). *Website of the National Moroccan phosphates company*., 2013, from <http://www.ocpgroup.ma/>
- PriceWaterhouse Coopers. (2009). *Changing dynamics: India's aerospace industry* National Committee on Defence Confederation of Indian Industry.
- Tanger Med Port Authority. (2013). *Website of the Tanger med port authority*., 2013, from <http://www.tmpa.ma/>

The Economist Intelligence Unit. (2013). *Country report: Morocco. outlook for 2013-2017*.The Economist.

Turkish Aerospace industries. (2013). *Website of turkish aerospace industries.*, 2013, from <https://www.tai.com.tr/en/project/bombardier-c-series-fte-program>

United Nations. (2013). *Database UNComtrade* (United Nations ed.)

United Nations Development Program. (2013). *Human development index.*, 2013, from <http://hdrstats.undp.org/en/countries/profiles/MAR.html>

World Bank. (2011). *Doing business 2012: Doing business in a more transparent world*The World Bank.

World Bank. (2013). *Country profile of morocco.*, 2013, from <http://www.worldbank.org/en/country/morocco>

World Economic Forum. (2012). *Global competitiveness report: 2012-2013*World Economic Forum.

Appendix

Figure A.1: Map of Morocco (The Economist Intelligence Unit, 2013)



Table A.1 Economic comparison of Morocco to its Peers

	Morocco	Tunisia	Turkey
GDP growth	2.8 % in the 1990s to 4.8% in 2012	0.6% in 2012; widely fluctuating, for example, it was 4.60 % in June of 2011 and became -7.80 % in March of 2011	0.2% in 2012, widely fluctuating, for example was 6.69 % in June of 2009 and 7.57% in March of 2009.
GDP (Billion of U.S. Dollars)	From 25.8207 in 1990 to 100.221 in 2012	From 12.3 in 1990 to 45.864 in 2012	From 150.598 in 1990 to 773.091 in 2012
Industrial production	0.2%	0.49%	4.4%
Population (millions)	32	10.67	73.64
Inflation	2.2%	6.4%	6.13 %
Public debt (% of GDP)	From 89% in 1990 to 56% in 2012	From 66% in 1990 to 43.5% in 2012	From 51% in 2000 to 36 % in 2012
Unemployment	9.4% (down from around 14% in 2000)	16.7%	9.4 %