



**Investment**  
in  
**exploration-production**  
and  
**refining**  
  
**2011**

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## EDITORIAL

2011 will have been a very eventful year from a geopolitical, economic and energy-related perspective, with both short and long-term consequences.

The revolutions in North Africa and the Middle East first and foremost. They can be hailed for the changes in outlook that they bring with them. But there could still be more upheavals, once again giving rise to concerns over the availability of supplies. So geographical diversity and finding new energy solutions are still essential.

In this respect, the choice of China is noteworthy. It is now impossible to overlook coal and renewable energies: China is currently the leading country - ahead of the US - in terms of investment in renewable energies.

As far as nuclear power is concerned, Fukushima clearly raises questions over the future of this industry - at least in Western countries; and Germany's decision to close all of its nuclear reactors is very much a reaction to the Fukushima accident. There is still uncertainty over what the future holds, but it is already weighing - and will doubtless continue to do so - on the gas market.

And after the much heralded shale gas, shale oils are now growing in popularity in the US. The US administration has completely understood just how important environmental issues are. It is going to have to adopt a flawless approach.

To end this overview, it's worth looking at a final point that has more to do with the economy: the sovereign debt crises of Western countries which are having a significant effect on the market. We can discern two clearly distinct periods over the course of the year: first the increase in the price of crude oil in the first half, driven by events in North Africa and the decline in production in March in Libya (which led to oil peaking at \$125). The debt crisis led to an initial correction in May, followed by a dramatic fall in August, taking the price of Brent crude oil back down to \$104 a barrel.

But in spite of all of this uncertainty, confidence is starting to return in terms of exploration and production. Oil companies are increasingly optimistic and are stepping up their investments, particularly in onshore drilling and offshore construction. Although the recovery in offshore exploration and production (which has been significantly affected by the moratorium on deep offshore drilling in the Gulf of Mexico) has been more moderate, the outlook is encouraging: there have been major developments in Brazil and calls for tender have been issued for new permits in the Gulf of Mexico for December this year. So the recovery that began in 2010 is now well and truly under way.

As far as refining is concerned, there has been an increase in investments right across the board in 2011, and the projects that were announced are now making good progress. But the issues are not the same for emerging and/or producer countries as they are for industrialised countries. The high demand in emerging and/or producer countries is what is driving this growth. OECD countries, on the other hand - the US and Europe in particular - find themselves having to grapple with problems to do with the sector's profitability in the face of internal demand that is structurally moderate and refining facilities that are poorly adapted. The situation in 2011 hints at an increase in refining overcapacity in the mid-term at global level - and this will doubtless penalise refining activities in the North Atlantic basin even more.

And the geopolitical, economic and energy-related events of the summer of 2011 have brought with them even more uncertainties. The possibility of the world's industrialised countries enjoying only sluggish growth or even slipping back into recession, and the Chinese economy - and the world's developing countries more generally - performing poorly in 2012 are all reasons to look again at current forecasts.

**SUMMARY TABLE OF INVESTMENTS:**

<b>\$ billion</b>	<b>2010</b>	<b>2011</b>
<b>Global investments in E&amp;P</b>	<b>471</b>	<b>542</b>
North America	128	148
Rest of the world	343	393
<b>Upstream markets analysed:</b>	<b>120</b>	<b>128</b>
Geophysical market	11	12
Drilling market		
onshore	18	22
offshore	39	38
Offshore construction market	52	56
<b>Refinery investments</b>	<b>65</b>	<b>68</b>
Investment spending	24	25
Maintenance spending	26	27
Catalyst and chemical spending	15	16

## Sources:

- Upstream oil sector, IFPEN from
  - o global investments: Barclay's, DTI, NPD, DEA, figures published by various companies and States, IFPEN forecasts
  - o geophysical market: IHS Energy, World Geophysical News, First Break, Spear&Associates, IFPEN
  - o drilling market: ODS Petrodata, Offshore Rig Locator, Spears&Associates, IFPEN
  - o offshore construction market: ODS Petrodata, Offshore Construction Locator, Spears&Associates, IFPEN
- Downstream oil sector: IFPEN from HPI Market data, IFPEN forecasts

## 1 Price changes in an unstable context

### ❖ The economic and geopolitical context is affecting oil prices

The average price of Brent crude oil for 2011 should settle at around US\$110 per barrel. Brent is more representative of the international context than WTI crude oil (\$95 per barrel) which has been heavily influenced by specific local conditions in the US since November 2010. The average price of WTI - which has been increasing dramatically compared with the US\$79 average for 2010 - has now exceeded the record \$97 that it reached in 2008.

The price increase over the course of 2011 started in the first half of the year, driven by the revolutions of North Africa and the Middle East. These events began in Tunisia before spreading to Egypt, Syria, Libya and a few countries in the Middle East (Yemen and Bahrain in particular). The return of the geopolitical risk premium resulted in the \$100 per barrel threshold being exceeded in February. In March, the fall in production in Libya resulted in prices peaking at more than \$125 per barrel.

In May, economic and financial fears over sovereign debt crisis in Europe and the US were once again at the forefront of people's minds, exerting downward pressure on the financial and oil markets. This initial bearish correction was followed by a second of around \$15 in August following the panic which broke out on the markets after the downgrading of the US's credit rating and Europe's failure to come up with any solutions.

Since then, the market has been in a state of unstable equilibrium. Oil prices are fluctuating between \$103 and more than \$110, influenced by varying perceptions of the economic and financial situation in Eurozone countries, growth corrections for emerging countries and recent tensions in the Middle East - in Saudi Arabia and Iran in particular.

Looking forward to 2012, economic growth and the geopolitical situation will continue to affect prices. With the IMF now forecasting a global growth rate of 4%, prices of more than \$100 per barrel are likely. Another scenario involving geopolitical stability and a more pronounced economic slowdown would be likely to drive the price of Brent crude oil down to \$80 per barrel. The general instability of the world economy explains this considerable discrepancy and the high levels of volatility which will most likely result from it.

### ❖ Gas prices: significant differences

The indexed prices of long-term European contracts have been significantly affected by increases in oil prices since 2009. Currently standing at more than €30 /Mwh - or \$13/MBTU - they are reaching highs that they occasionally exceeded in 2008. Prices today are being driven by market trends, influenced by events on the oil market.

At the other end of the scale, the US market is currently characterised by an abundant supply, which has resulted in prices that have held steady at around \$4/MBTU since 2009. This is the "shale gas" effect, production of which is going to be subject to stricter environmental regulation. This was the message sent out by the commission that Barack Obama set up in August.

Prices on the UK market - which have been on the increase since 2009 together with the price of coal - are in the middle of these two extremes. Fears on the LNG market, linked to the Fukushima effect which pushed prices in Asia up to \$17/MBTU, are running the risk of creating tensions on the European spot market this winter. But there are also some factors which could result in prices being pushed down - such as a slowdown in the growth of the European economy, the arrival of Russian gas via the North Stream and the likely return of Libyan gas. A below par rating compared with indexed prices is the most likely scenario.

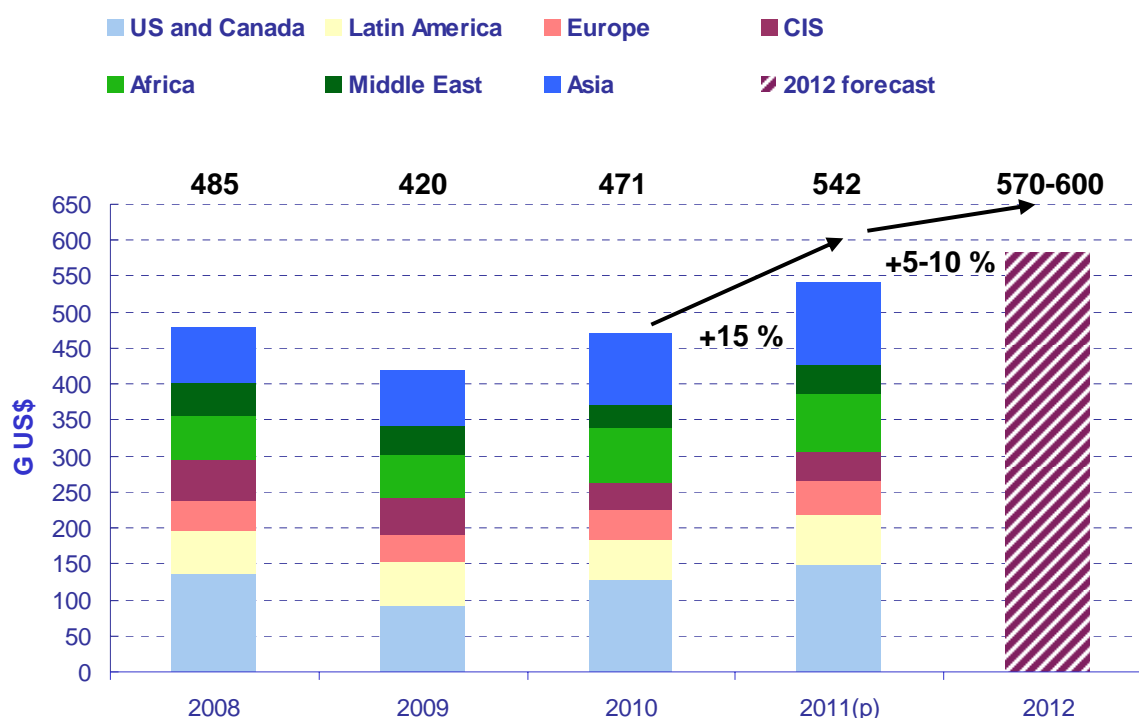
## 2 Expiration-Production: confirmation of the recovery

### 2.1 Accelerated growth in investments

After an increase of more than 10% in 2010, investments in exploration/production should increase by a further \$70 billion in 2011 to exceed **\$540 billion (G\$) - an increase of 15%** on the previous year. This increase will affect all geographical zones - although growth rates will be different from region to region. The Middle East and Latin America, for example, look set to be the most dynamic regions, enjoying growth rates of 25 and 23% respectively. Investments in the CIS zone and in Africa, on the other hand, will be lower, with increases of only 3 and 6%, respectively. Other regions will enjoy average increases of approximately 15%.

We are expecting the upward trend to continue into 2012, with growth of between 5 and 10% predicted. A number of ambitious projects are currently under way. In the US, exploration and development of shale gas and oil will continue to sustain investment for several years to come. In Brazil, Petrobras is planning to invest massively in Exploration and Production between 2011 and 2015 in order to develop its pre-salt layers. In Oceania, investment looks set to increase rapidly, driven by major LNG projects in Australia and Papua New Guinea. And considerable investments will be needed in Iraq in order to meet the production target of more than 12 mbd by 2017.

**Figure 1: Change in global investment in E&P**



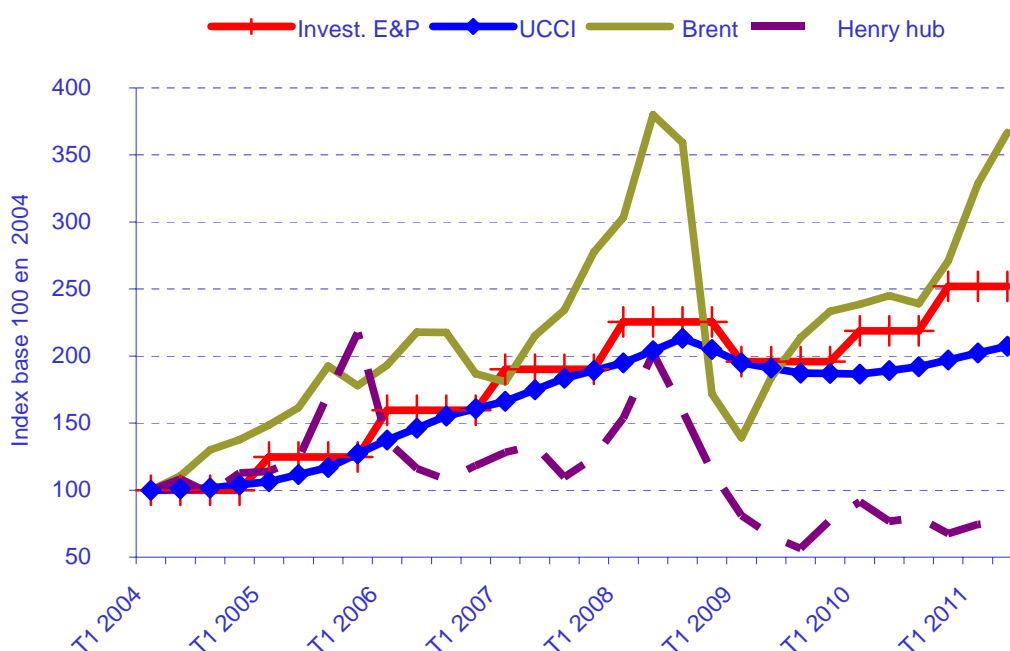
E&P investment has increased in all regions in 2011 compared with 2010. The most significant increases have been in the Middle East and Latin America. In the Middle East, Saudi Aramco is investing considerable sums in order to maintain a production capacity of 12.5 mbd. And the development of fields in Iraq is gathering momentum. Petrobras is seeking to increase production in Latin America by 55% between 2010 and 2015 - the new five-year plan for 2011 provides for \$127.5 billion of investment in E&P between now and 2016. The budget set aside for developing pre-salt fields is being increased by \$20 billion

compared with the 2010 plan. In the US, the development of shale oil has been the main engine driving investment this year. In Oceania, Australia is intending to vie with Qatar to become the leading producer of LNG between now and the end of the decade. Five major projects are currently in construction (including the giant Gorgon) and a dozen or so others are at various stages of assessment. In Europe, considerable investments are needed to curb the decline in production in the North Sea. Despite its maturity, this zone is still attracting operators - as evidenced by Apache's recent purchase of ExxonMobil's assets in the North Sea for \$1.75 billion. Investment in Africa has suffered from the instability currently affecting the Maghreb region and Egypt. It has also been affected by the elections in Nigeria, but international companies have continued to invest in West and East Africa. Growth has been weakest in the CIS zone (3%) following the dramatic fall (-25%) in Gazprom's investments.

Companies of all types (national, international, major or independent) have increased their investments:

- The 5 major companies - whose increase in investments had been steady between 2009 and 2010 - have all played a major role in the global increase for 2011, with average growth standing at 15%. Total (+38%), BP (+29%) and Shell (+24%) are the most dynamic.
- The budgets of the world's independent international companies have increased by an average of 23%. Growth has been particularly strong in the US (32%), with American independents investing heavily in developing shale oil reserves.
- National companies have increased their investments by 12% - less than companies in the first two categories - but the situation varies considerably from region to region. In Africa, for example, investments from national companies look set to fall by nearly 20% in 2011 - as a result of the "Arab spring" and the elections being held in Nigeria. The CIS zone has seen an 8% fall in investments from national companies as a result of Gazprom (see above). Growth is strong elsewhere: 17% in Asia, 23% in Latin America and 27% in the Middle East.

**Figure 2: Change in E&P investment, prices and costs**



Although 2010 saw an increase in E&P investment after the freeze of 2009, 2011 has the upwards trend picking up speed. The rise in oil prices (the first quarter of the year saw a near return to the record levels of 2008) has created a climate which encourages the development of new projects - despite the fact that rising costs give rise to caution. The IHS/CERA Upstream Capital Cost Index (see Figure 2) - which had remained relatively stable throughout the first half of 2010 after a marked decline in 2009 - has been on an upwards trend over the last 12 months and is close to its high point of mid-2008. The rise in steel prices and growing demand have affected the cost of equipment. In Asia and Latin America - Brazil in particular - tensions on the labour market created by strong demand have given rise to increases in the cost of labour.

❖ *The development of shale oil in the US*

It has long been known that there are shale oil resources in the US, but it has only recently been deemed profitable to exploit them. Improvements in horizontal drilling techniques and hydraulic fracturing, as well as the rise in oil prices, have changed the situation. Consequently, oil production in the North Dakota Bakken formation has increased from 10,000 barrels per day in 2003 to more than 360,000 barrels per day in 2011. The cost of production is estimated at less than \$50 per barrel for these light oils (API of 42 for Bakken crude oil). This is comparable to the cost of very deep offshore reserves in the Gulf of Mexico or the Canadian sand oil reserves.

In the US, operators have been dramatically stepping up their investments in developing shale oil reserves since 2009. In 2011, there should be twice as many oil drilling operations as gas drilling operations - the reverse of the situation that prevailed up until 2006-2007. This trend looks set to continue over the years to come, and will help maintain US investments at a high level. The EIA (Energy Information Administration) is actually predicting that shale oil production will triple between now and 2016, reaching 1.4 mbd.

Shale oil production currently comes from three main reserves: Bakken in North Dakota (this formation also extends into parts of Montana and Saskatchewan and Manitoba in Canada), Niobrara in Wyoming and Eagle Ford in Texas. These reserves all have substantial potential. According to USGS's estimates in 2008, the Bakken formation contained 4 billion recoverable barrels of oil. A study carried out by the North Dakota Geological Survey in 2010 added an additional 2 billion barrels from an adjacent formation. The IHS CERA recently put the total number of recoverable barrels from the six main reserves in the US at 17 billion.

The money that oil companies have recently invested in shale oil is evidence of their interest in these reserves. There were six asset acquisition operations in Bakken in 2010, representing a total of \$4.3 billion. At Eagle Ford, Marathon Oil bought Hilcorp Resources from the KKR private equity firm in June for \$3.5 billion. This acquisition, together with the other transactions planned for 2011, will see Marathon Oil double the surface area over which it operates in Eagle Ford. Although the majority of operators are currently American independents, the development potential of shale oil is also sparking the interest of the Majors and other international companies. In 2009, ExxonMobil's takeover of XTO provided it with an opportunity to establish a presence both in Bakken and Eagle Ford. Chinese group CNOOC invested \$3.4 billion in 2010 and 2011 in order to access the Eagle Ford and Niobrara reserves through two joint-venture agreements with Chesapeake.

Oil companies are also starting to get interested in shale oil potential outside the US. For example, in January 2011, Sinopec signed an agreement with Hess to survey the shale oil reserves in the formation. Similarly, through the agreement that was entered into in August between Exxon and Rosneft, Exxon will be able to access shale oil reserves in Siberia in exchange for Rosneft being able to exploit the Eagle Ford oil. A number of exploration

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licences have been requested for the Paris Basin, but the projects have been postponed following the moratorium - and then the ban - on hydraulic fracturing.

Despite its high potential, the development of shale oil production could come up against a number of obstacles. In the US, production growth in some regions might find itself limited by the capacity of transport infrastructure. But several projects to develop pipelines that are already under way may be a solution to the problem. The main open issue is still the factoring in of the environmental impact. The technologies used are the same ones as those used for shale gas, and they give rise to the same concerns in relation to water management.

❖ *Iraq: production aims could be revised downwards*

Production in Iraq reached 2.7 mbd in 2011 - an increase of around 200,000 barrels per day compared with the previous year. The Iraqi government wants to see production rise to more than 12 mbd by 2017. Most observers do not consider this target realistic and are instead predicting production of between 5 and 9 mbd by this time. The government seems implicitly to have recently recognised the need to revise its targets downwards: on the fringe of the OPEC summit of 8 June 2011, the Iraqi oil minister actually stated that Iraq was looking into the possibility of reducing its production targets. Indeed, there are still a great many obstacles that are running the risk of delaying the development of projects in Iraq.

In particular, operators are complaining about heavy bureaucracy, logistical constraints that are making it difficult to import the equipment they need, the lack of qualified labour and local opposition from people who want to see more benefits for themselves from oil exploitation. At a more global level - as the deadline for the complete withdrawal of US troops at the end of 2011 approaches - people are asking questions about security.

In Kurdistan, the absence of any kind of stable legal framework is hampering the development of projects. Negotiations between Baghdad and the semi-autonomous regional government (KRG) in relation to the legality of the contracts that have been allocated to overseas operators by the KRG are still in progress, and their outcome remains uncertain.

Growth in production will also depend on the necessary infrastructure being built: water and gas injection facilities, pipelines and export infrastructure. In the short-term, logistical constraints to do with the lack of port infrastructure and the dilapidated state of existing infrastructure are running the risk of hampering production growth until 2013 - which is when new offshore mooring points should come into service. According to the International Energy Agency, production in the short term may be limited to less than 3 mbd by export capacity throughout 2012. It could then grow at a rate of 300,000 barrels per day per year to reach 4.1 mbd by 2016 - still dramatically lower than official targets.

❖ *Gulf of Mexico: getting back to normal will take several years.*

The moratorium on offshore drilling that was declared between June and October 2010 by the US administration in response to the Macondo oil spill only applied to exploratory drilling and new developments. Consequently, it has had little in the way of an immediate impact on current production. It has, however, resulted in many projects being delayed. Once the moratorium expired, new regulations and the regulating body being restructured led to the amount of time needed to obtain drilling licences being extended. This is delaying a return to the level of activity that prevailed before the disaster.

In July 2010, the oil resource management body was split into three entities in order to do away with the latent conflict of interest between its various responsibilities (raising oil and gas revenue, applying regulations and developing resources). The new body - the Bureau of

Ocean Energy Management, Regulation and Enforcement (BOEMRE) – has been tasked with reviewing and strengthening the regulatory procedures that apply to offshore drilling.

The first post-moratorium drilling licence was granted in February 2011. But the time needed for new licences to be granted has been significantly extended, with 35 licences now been issued per year, as opposed to 84 previously. Although it looks as though the situation has been returning to normal since August, exploration does not look set to return to pre-accident levels until 2013.

Given that the productivity of wells in the Gulf of Mexico has been naturally falling at a rate of 12 to 13% per year, the suspension of drilling for nearly 10 months followed by a slow resumption has had a major effect on production. It fell by 12% over the first quarter of 2011 compared with the previous year. This trend looks set to continue into 2012: the EIA is forecasting production of 1.13 mbd, 570,000 barrels per day less than pre-accident levels (1.7 mbd). Production will not return to its 2009 level until 2016.

The new regulatory environment is creating additional costs and complications. The reactions of oil companies to these new regulations will affect the future production curve. The first sale of operating licences since the Macondo oil spill will be on 14 December. How successful this operation is will be a useful indicator of just how interested oil companies are in the Gulf of Mexico in this new context... all the more so since the minimum bid has now been increased from \$37.5/acre to \$100/acre.

❖ *Investments from the majors: towards new growth themes*

In 2011, the amount of money invested by the eight leading international oil companies (BP, Chevron, ConocoPhillips, ENI, ExxonMobil, Shell, Statoil and Total) accounted for nearly \$150 billion - 27.5% of the global total. In respect of the reserves that they control and their production, these players invest considerably more than the national companies. This is because the difficulties in accessing conventional reserves are inciting them to look for other more capital-intensive growth drivers.

Between 2001 and 2005, 63% of the money invested by the world's major oil companies involved conventional assets. According to Wood Mackenzie Research and Consulting, this share will fall to 40% between 2011 and 2016. The likelihood that fossil fuel prices will remain high for a long time and the emergence of new technologies are opening up new development possibilities for oil companies. The world's major oil companies are therefore investing ever-growing sums in four key investment areas: LNG, deep offshore and - to a lesser extent - unconventional oil and gas. These developments should sustain investment in the world's more geographically favourable zones.

Australia, for example, should see a significant rise in E&P investment: five major LNG projects are currently in construction (including the giant Gorgon) and a dozen or so others are in the design phase. These developments should see Australia become the world's second largest LNG exporting country after Qatar (IEA) by 2016.

In terms of E&P investment, the US and Canada will still be the most important zone (more than a quarter of global investments currently come from the zone). In the US, the development of shale oil reserves should result in production being tripled by 2016. The Gulf of Mexico and the Canadian sand oil reserves will also continue to drive growth. Wood Mackenzie predicts that investments in the US and Canada should reach \$600 billion over the next four years (2011-2016), without factoring in exploration.

Brazil and the Gulf of Guinea will also be able to take advantage of major offshore developments.

❖ *The outlook for deep and ultra-deep offshore*

Total offshore oil production is estimated at around 25 mbd - more than a quarter of global production. Deep offshore production (at depths of more than 500 m) and ultra-deep (at depths of more than 1500 m) account for approximately 20% of current offshore production. But this share is currently rising dramatically and should be closer to around 30% by 2016. As far as gas is concerned, offshore production accounts for 30% of the world share.

The majors are the most active companies in developing offshore reserves. Petrobras is one of the rare national companies that is heavily involved in deep offshore. Because of the growing difficulties that it has been encountering in accessing conventional gas reserves, the international companies are looking towards more complex developments in order to ensure their growth and the renewal of their reserves. Oil prices continuing to remain at high levels means that more sophisticated and expensive technologies can be used - technologies that are necessary if prospective deep or ultra-deep offshore reserves are to be developed.

There are an estimated 28 Gbep of new oil and gas reserves that will be developed in deep offshore operations between 2011 and 2015. According to Infield, these developments will require \$210 billion of investments distributed as follows: pipes and flow systems (38%), underwater completions (36% and platforms (20%). This sum has increased by 60% compared with the 2006-2010 period. To give an order of magnitude, 1300 underwater wells are planned for between 2011 and 2015. Most of the planned developments are concentrated in three regions: Africa, Brazil and the Gulf of Mexico.

Africa will get a third of the investments over the period 2011 to 2015 - \$70 billion. In particular this will be used to develop the major deep-water offshore pipeline between Algeria and Italy, as well as for developing the floating production system for use in Total's Egina field in West Africa. Latin America and North America will both get \$50 billion. The effects of the Macondo oil spill on the Gulf of Mexico are now starting to fade and deep offshore development should eventually return to its pre-accident levels - despite it now being more difficult to obtain drilling licences.

## 2.2 Oil equipment and services: the recovery continues, markets are growing

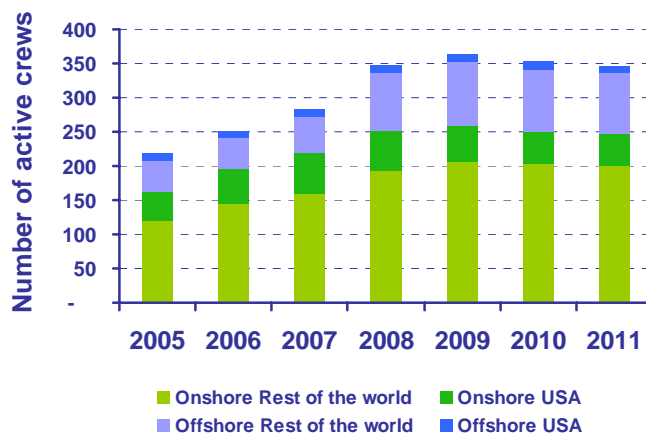
### 2.2.1 Geophysics

#### 2.2.1.1 Relatively stable world seismic activity

The number of seismic crews in 2010 stabilised at 360 active crews across the world - a slight fall (-1.4%) compared with 2009. Seismic activity has doubled in 5 years since the 2004 low point when there were only 180 active crews. But the world financial and economic crisis that started to take hold at the end of 2008 put an end to growth in this sector. World seismic activity has not grown since 2009, but has remained stable.

70% of the world's active seismic crews operate onshore - the rest offshore. 20% of all seismic activity takes place in the US - the remaining throughout the rest of the world.

**Figure 3: Change in the average number of annual active onshore and offshore crews**

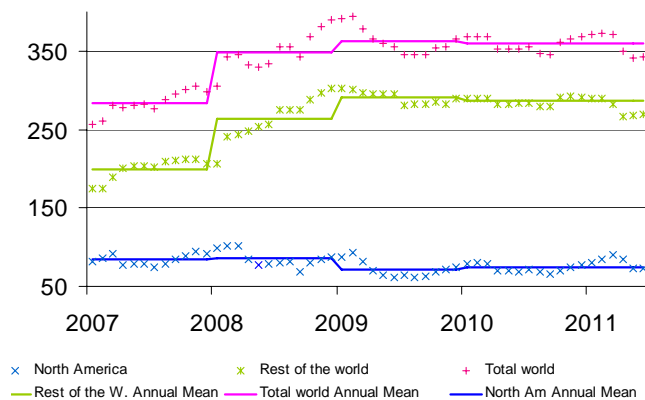


Sources: IFPEN, IHS energy, World Geophysical News

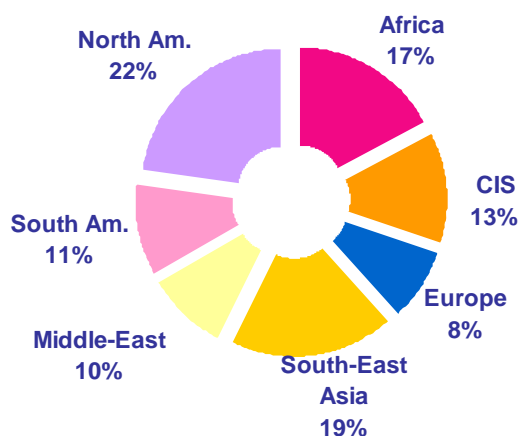
Since early 2009, the US has been bearing the brunt of the crisis as far as seismic activity is concerned. Activity has fallen by 16% without any real recovery being felt in 2010 - as has been the case for other more heavily affected activities (onshore drilling, for example).

International activity (outside North America) - which accounts for 80% of all activity - is sustaining the world market. It had in fact continued to rise in 2009, stabilising in 2010 with an annual average of 286 active seismic crews.

**Figure 4: Change in the average number of active seismic crews per month in North America and throughout the rest of the world**



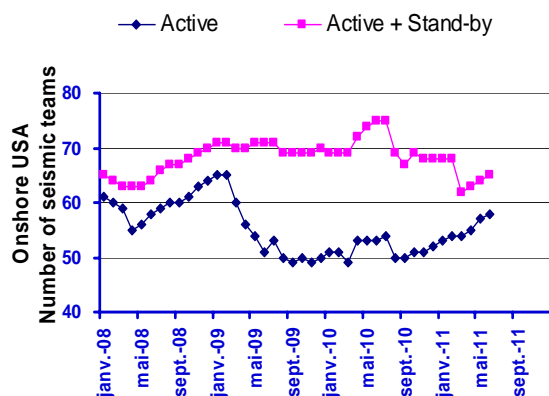
**Figure 5: Geographical distribution of active crews in the first half of 2010**



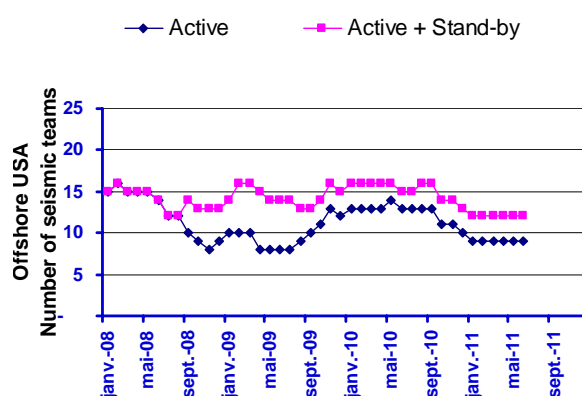
In 2011, the level of activity worldwide fell slightly (-1.4%) in the first six months of the year compared with 2010. The largest drop has been in Africa (-14%), mainly due to the Arab spring and prospecting campaigns in Egypt and Libya being either cancelled or postponed.

Seismic activity in US over the first half of 2011 held steady. In Canada, it increased by 70%. The only other zone which saw an increase was Latin America (4%). All other geographical zones held more or less steady in terms of activity. Over the first half of 2011, activity in the US was stable overall, but not the same for onshore as for offshore. Onshore activity increased by 7%, whereas offshore activity - mainly in the Gulf of Mexico - fell sharply (-30%) in the wake of the Macondo oil spill.

**Figure 6: Active and standby onshore seismic crews in the US**



**Figure 7: Active and standby offshore seismic crews in the US**

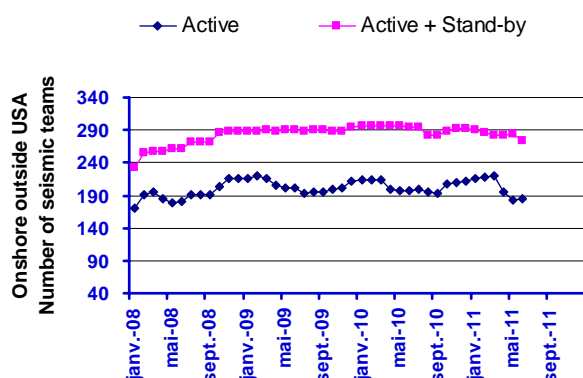


Sources: IFPEN, IHS energy, World Geophysical News

Throughout the rest of the world, crew occupancy rates were higher offshore (85%) than onshore (65%) during the first half of 2011.

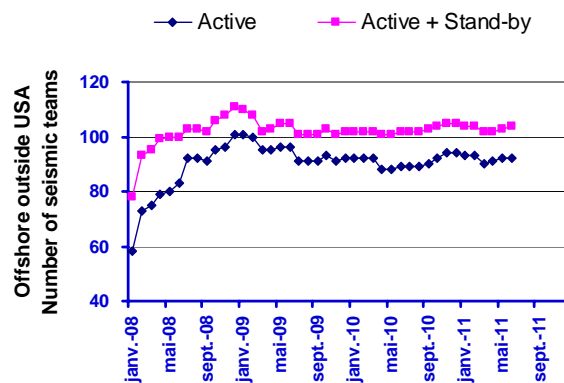
In the US, the number of onshore standby crews fell sharply over the first 6 months of 2011, whereas the number of offshore standby crews remained stable.

**Figure 8: Active and standby onshore seismic crews worldwide, excluding the US**



Sources: IFPEN, IHS energy, World Geophysical News

**Figure 9: Active and standby offshore seismic crews worldwide, excluding the US**



### 2.2.1.2 A global market which is growing

Global turnover from geophysics is highly concentrated: the 2 leading companies - CGGVeritas and WesternGeco - account for half of all turnover and in all, 85% of the market is controlled by 10 companies.

The market can be segmented into 2 activities:

- the sale of equipment to acquire seismic data,
- the acquisition and processing of onshore and offshore seismic data

**Table 1: Market share of the major companies in the geophysics market in 2010**

Geophysics companies	2010 market share in %
CGG Veritas	25
Schlumberger	24
Petroleum Geo-Service	9
Halliburton	6
Fugro	5
TGS-NOPEC	5
Geokinetics	5
ION	3
China Oilfield Services	2
OYO Geospace	2

Over the first 6 months of 2011, world turnover from geophysics grew by 6% - mainly thanks to the acquisitions and processing market which grew by 7%... although the equipment market only grew by 1% compared with the previous year. It is estimated that three quarters of the "acquisitions and processing" market segment comes from offshore seismic activity.

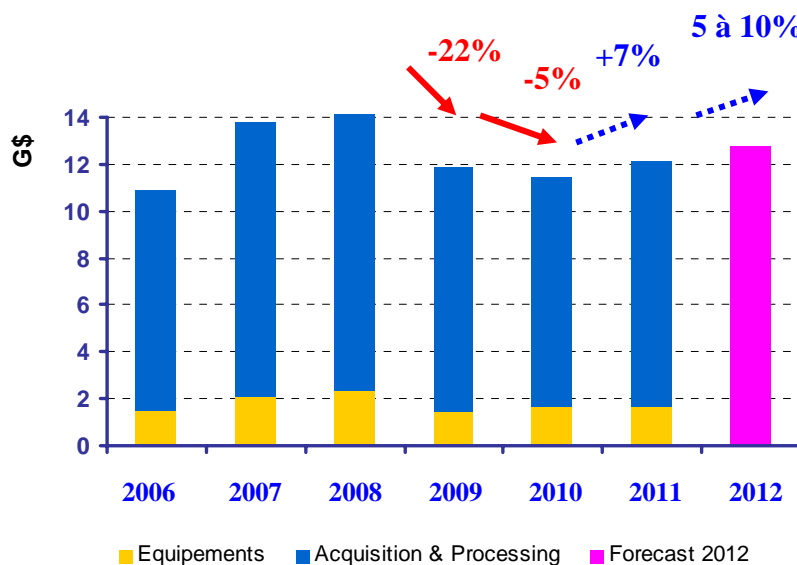
For 2011, the world geophysics market looks set to reach \$12 billion, with equipment accounting for \$1.6 billion and acquisitions and processing for \$12.5 billion.

In 2010, the market had shrunk by approximately 5%, whereas the equipment segment grew by 12% in 2011 and the acquisitions and processing market fell by 5%.

Keeping seismic activity at a healthy level and rationalising the acquisition equipment by re-converting and decommissioning the oldest boats helps reduce overcapacity and helps boost

the prices of services - prices which had remained low in the wake of the 2009 crisis. The increase in prices that had been expected in 2011 now seems to be under way and should take more of a hold in 2012.

**Figure 10: Change in turnover for the geophysics market, estimate for 2010 and outlook for 2011**



#### 2.2.1.2.1 An increase in acquisition prices

- **Overcapacity in acquisition equipment is reabsorbed**

Geophysics contractors are all expecting an increase in seismic ship hire rates for 2012.

Since the Macondo oil spill, it has been difficult to obtain exploration licences in the Gulf of Mexico, and this has led to a drop in activity in the sector. But activity should resume with new licences being allocated in December 2011.

Elsewhere, Brazil should offer 174 exploration blocks in early 2012 - both onshore and offshore - over 9 sedimentary basins.

- **Growth themes and regions**

Continuing with shale gas exploration in the US (Utica basin) and prospecting for equivalent reserves in Mexico and Eastern Europe (Poland and Ukraine) should generate a significant volume of exploration.

In June 2011, the Norwegian government issued a call for tenders for the allocation of 12 deep offshore licences for the Norwegian Sea, and 12 other licences for the Barents Sea. This decision comes after a treaty that was entered into by Norway and Russia on the delimitation of the Barents Sea and Arctic Ocean and on offshore cooperation between the two countries for the purposes of exploring these zones and quantifying their oil and gas potential.

Offshore exploration in the eastern part of the Mediterranean - particularly off the coast of Lebanon, Cyprus and Syria - is being resumed following discoveries of gas off the coast of Israel and Egypt.

- **Significant numbers of mergers and acquisitions**

**Dawson Geophysical** purchased TGC Industries in March 2011. Dawson Geophysical is the US's leading onshore data acquisition company, and 11th in the world in terms of market share. TGC Industries ranks 15th and is specialised in multi-client libraries.

In early September, **EMGS** announced that it had entered into an agreement with SeaTrans Group and Sector Asset Management for the acquisition of OHM, a company specialised in acquiring offshore electromagnetic data.

By mid-September, **CGGV** should finalise an agreement with Spectrum to take on a 25% stake in the company in exchange for 500,000 km of seismic data and partnerships.

Brazilian seismic companies GeoQuasar Energy Solutions and Stratageo Soluções Tecnológicas are merging to create **GeoQuasar STTG**. Given the volume of exploration being carried out in Brazil, by 2015, this new company could be among the world's 10 largest in terms of turnover.

**CGGV** is creating a joint subsidiary with the Indonesian company Elnusa in order to broaden its market in Southeast Asia - particularly its business in Indonesia and Vietnam.

**TGS** is buying Stingray - specialised in providing advanced permanently installed reservoir monitoring solutions. The company owns a fibre-optic monitoring system that was initially developed for use as an anti-submarine system in defence in the 1980s.

#### *2.2.1.2.2 Geophysical equipment constantly evolving*

CGGV - whose subsidiary Sercel is a leader on the geophysical equipment market (60% market share) - is optimistic about 2012. It predicts that the equipment sector should become more buoyant and generate growth of in excess of 10% - even close to 15%.

The technical areas which are likely to generate growth in terms of data acquisition include:

- increasing the number of channels in the acquisition laboratories, and the option of wireless recording with real-time analysis - as provided by Sercel's UNITE system and the 428XL acquisition system.

- the development of micro-seismic monitoring in order to monitor reservoirs, either using conventional systems (geophones, hydrophones), like the system installed in the Valhall oil field, or by using MEMS accelerometers (like Octio Geophysical) or even fibre optics, like OctoPlan, Sercel, PGS and Stingray.

- competition between contractors to offer offshore data acquisition solutions that improve the band of frequencies recorded, such as CGGV's Broadseis solution, Sentinel's streamer solid solution and PGS's dual stream solution.

- electromagnetic methods - the CSEM (Controlled Source ElectroMagnetic) technique in particular, which is increasingly popular.

- Full Azimuth imaging using Coil Shooting acquisition, developed by Western Geco. This involves getting the boat in question to describe a shifted circular trajectory, an economic way of ensuring multi-azimuthal coverage with only one data acquisition boat.

### **2.2.1.3 An encouraging outlook beyond 2011**

For 2012, the unused offshore seismic crews should be reabsorbed - particularly in the Gulf of Mexico - which will once again rebalance overcapacity and should push prices up.

In the mid-term, contractors' capacity for technological innovation combined with the challenges of oil exploration should continue to push activity into more high-tech areas and ensure that equipment is renewed.

In the longer term, high oil prices - over \$100 a barrel - will ensure growth in the exploration sector.

## **2.2.2 Drilling**

### **2.2.2.1 The onshore recovery continues**

It is estimated that 116,000 wells will be drilled worldwide in 2011. This represents a 17% increase, following on from the 27% increase in 2010.

The onshore drilling sector, which accounts for 97% of the world's wells, continued its recovery over the first half of 2011, with 18% growth compared with 2010. The offshore sector, which was not as severely affected by the 2009 crisis, but has had to cope with the moratorium in the Gulf of Mexico, posted a 4% increase during the first half of 2011.

- **Onshore drilling**

#### ***Growth in activity***

Drilling operations worldwide rose by 18% during the first six months of 2011 compared with the same period a year earlier, following strong growth in 2010 of 28%.

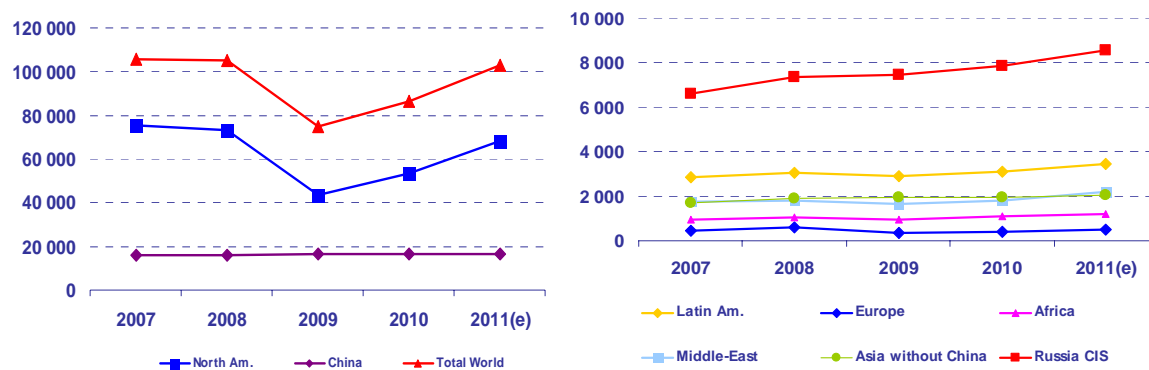
This growth was due in large part to a 25% increase in drilling activity in North America - both in the US and Canada. It had fallen considerably in 2009 as a result of the world economic and financial crisis. With around 79,000 onshore wells being drilled in the US this year, activity levels should be higher than they were before the crisis - around 73,000 wells in 2008.

The second geographical region to have grown significantly is the Middle East which has seen 22% growth - mainly due to drilling activity in Iraq having almost tripled and to strong growth in Kuwait (60%). Levels of activity in other countries - including Iran and Saudi Arabia - have remained unchanged.

Europe - and mainly countries outside the North Sea zone (Italy, Denmark, Germany, Poland and Spain) - has been marked by growth which should reach 20% in 2011. This is due to conventional oil and gas developments, as well as the development of shale gas (Poland and Spain).

No geographical zone has seen a fall in activity: Latin America has seen 10% growth, Russia and the CIS countries have seen 8% growth, Southeast Asia (not including China) and Africa have both seen 6% growth. China has seen the lowest growth - only 0.5% - and has been concentrating its efforts on offshore developments.

**Figure 11: Change in the number of onshore wells drilled by geographical region (estimates for 2011)**



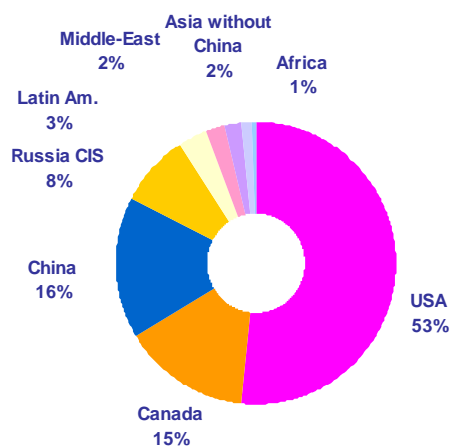
Sources: IFP, Baker Hughes, Spears & Associates

### Locations of activity

Of the 113,500 wells that are expected to be drilled onshore in 2011, 55% of them are in the US. North America (the US and Canada) accounts for 70% of all wells drilled worldwide.

The other two countries with major onshore drilling operations are China (with 14% of the world's wells) and Russia (7%). In all, these two countries plus North America are home to 95% of the world's onshore drilling. Despite its significant reserves and its production, Saudi Arabia accounts for a little under 2% of all onshore wells drilled per year, as is the case with Southeast Asia.

**Figure 12: Number of onshore wells drilled by geographic region**



Sources: IFP, ODS-Petrodata

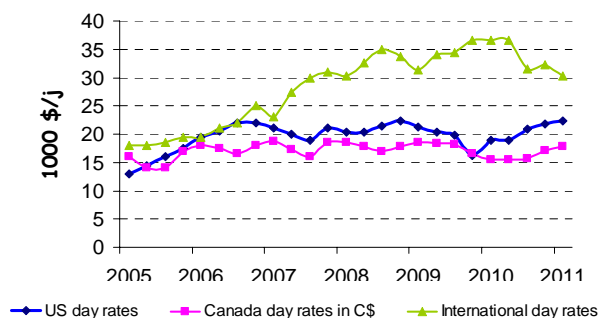
### Onshore rates

As was the case in 2010, there are two clear opposing trends, for the US and the rest of the world, but going in different directions this year.

For the first quarter of 2011 in North America there was a clear recovery in onshore rig rates - with an increase of 18% in the US and 15% in Canada. This recovery can mainly be attributed to the ever-growing numbers of horizontal wells being drilled - particularly for producing shale gas.

For the rest of the world, however, having exceeded \$35,000/day in 2009, rig rates fell by 17%, with an average rate of \$30,000/day at the start of the year.

**Figure 13: Onshore rig rates in thousands of US dollars for the United States, Canada and worldwide**



## • Offshore drilling

Offshore drilling increased by 3.5% during the first half of 2011 compared with the same period a year earlier. It had increased by the same rate in 2010 (3%). With 3400 offshore wells expected to be drilled in 2011, we have not yet returned to the levels before the economic and financial crisis (when in excess of 3500 wells were being drilled).

### **Growth in activity**

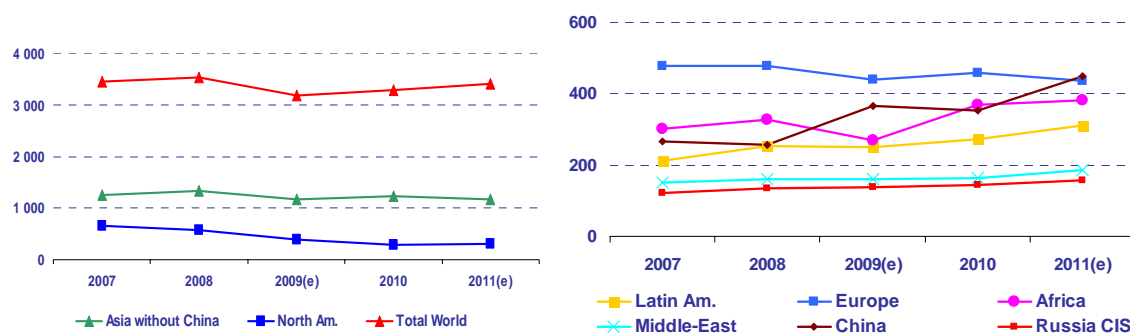
Over the first six months of 2011, China saw the strongest growth (27%), with 9 new offshore fields. South Asia - excluding China, which historically has been the largest offshore player - saw a 4% decline, however, compared with the same period in 2010.

The second strongest growth was in Latin America - in Brazil in particular with its deep offshore developments. It has enjoyed 14% growth compared with 2010. The Middle East is just behind it with 13% growth, followed by Russia and the CIS zone with 8% growth.

The Gulf of Mexico saw no growth (-1%) over the first half of 2011. The effects of the moratorium on deep drilling, together with the difficulties that operators have been encountering in obtaining new drilling licences, are still being felt. After the Macondo oil spill in 2010, activity in the Gulf of Mexico fell by 28% - the sector having already suffered considerably from the 2009 crisis with a 10% decline in activity. 2012 should finally see a recovery in drilling activities in the Gulf of Mexico.

Offshore activity in Africa - which still has a great deal of potential in terms of developing its reserves - is still growing (4%). The North Sea, on the other hand, has seen a fall of 4% with a slowdown in new fields being developed.

**Figure 14: Change in the number of offshore wells being drilled by geographic region (estimates for 2011)**



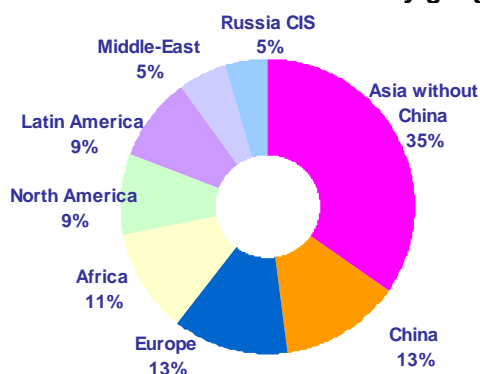
Sources: IFPEN, ODS-Petrodata

### **Locations of activity**

Southeast Asia accounts for nearly half of all activity worldwide, although China on its own accounts for only 13% - the same as the North Sea section of Europe. 11% of all activity is concentrated in Africa with its developments in the Gulf of Guinea.

With Brazil's increase in offshore drilling activities, Latin America now has a level of activity comparable to the Gulf of Guinea, with a 9% world share. The Middle East is just behind it, in equal place with Russia and the former Soviet republics.

**Figure 15: Number of offshore wells drilled by geographic region**

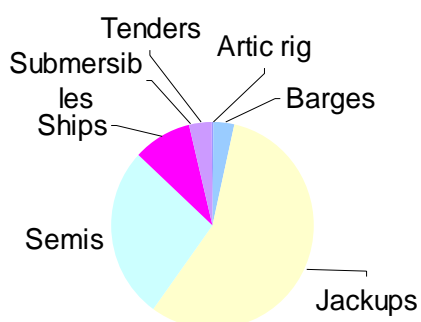


Sources: IFP, Baker Hughes, Spears & Associates

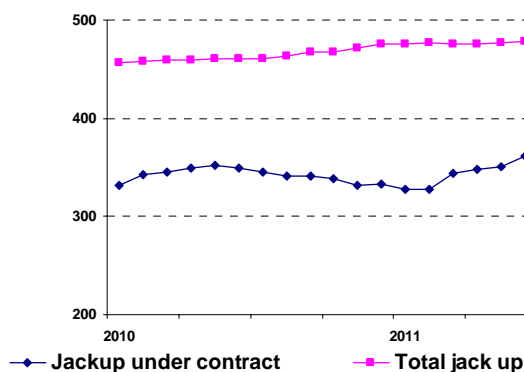
### Offshore drilling facilities

There were 645 drilling rigs under contract in mid-2011. More than half of these were jack-up rigs (56%), a quarter were semi-submersible and 10% were on drilling ships.

**Figure 16: Rig facilities, distribution by type**

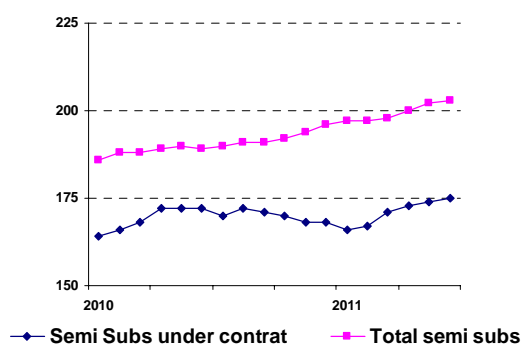


**Figure 17: Jack-up rigs and facilities under contract**

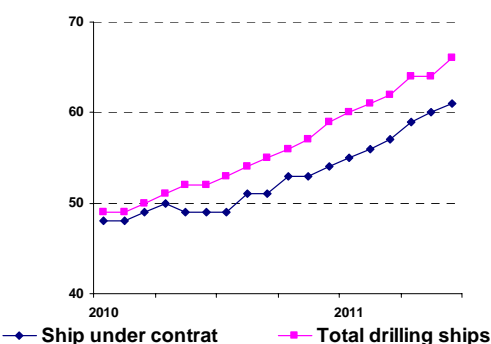


There were only 3 artic rigs in use in the world in the first half of 2011, two of which were under contract. There were six submersible rigs for use in drilling at shallow water levels (less than 100 m), but none of them were under contract. There were nearly 50 drilling barges, but their usage rates were low (44%).

**Figure 18: Semi-submersibles including equipment under contract**



**Figure 19: Drilling barges including equipment under contract**



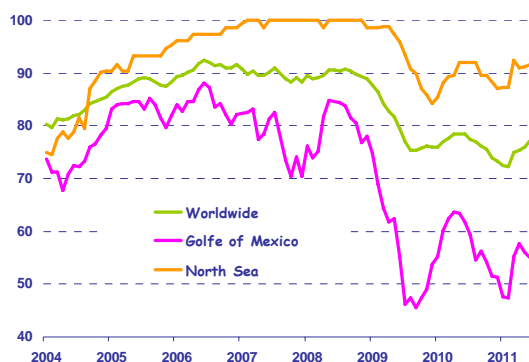
Despite falling usage rates, there was a significant increase in the numbers of jack-up rigs, semi-submersibles and drilling barges over the first half of 2011 - 4%, 6% and 20% respectively. This surplus continues to exert pressure on rig rates, preventing them from rising.

### **Utilisation rates in the offshore drilling market**

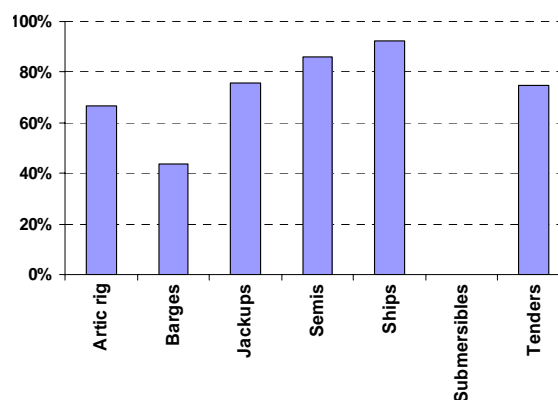
Having reached a low point in the third quarter of 2009, offshore drilling equipment utilisation rates fluctuated over the period 2010-2011 around a level that was considerably lower than before the crisis.

The average utilisation rate over the first six months of 2011 was 77% - stable compared with 2010. If we look at jack-up rigs, semi-submersibles and drilling barges, their average utilisation rates are 72%, 86% and 92%, respectively - a 3 to 4% fall over 12 months.

**Figure 20: Offshore rig utilisation rates by geographic region**



**Figure 21: Utilisation rates by offshore rig type**



Following the world economic and financial crisis, offshore rig utilisation rates have all fallen since the beginning of 2009 at different rates, depending on geographic region.

The Gulf of Mexico had utilisation rates of more than 80% before the crisis. This rate then fell to below 50% in mid-2009, climbing back up to just over 60% at the start of 2010. The Macondo oil spill then triggered a second fall in utilisation rates in mid-2010. The average utilisation rate was 53% over the first half of 2011 - 13% lower than the same period in 2010.

The utilisation rates for North Sea rigs have stabilised at around 90%, but have not recovered to their pre-crisis levels of close to 100%.

### **Offshore rates**

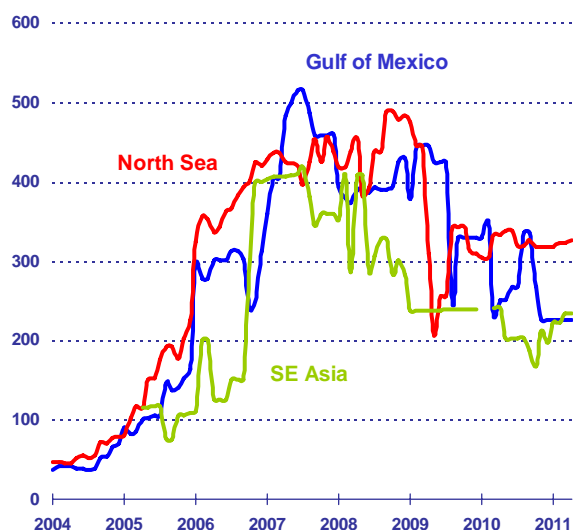
Generally speaking, right across all regions, offshore rates have remained considerably lower than the rates that prevailed before the 2008-2009 crisis (see figure 22 and 23). The rates for jack-up rigs have, however stabilised and started to recover across all regions (10%), whereas - conversely - rates for deep offshore and semi-submersible rigs have fallen by 10%.

In the Gulf of Mexico, jack-up rig rates increased by 16% over the first quarter - the highest of all increases. This is a sign of drilling activities being relocated to shallower seas. Rates for semi-submersible rigs fell by 22% - as a result of the Macondo oil spill and the moratorium.

The increase in rates for jack-up rigs in the North Sea was also significant - 13% - but less so than for the Gulf of Mexico. Rates for semi-submersibles have remained more or less stable.

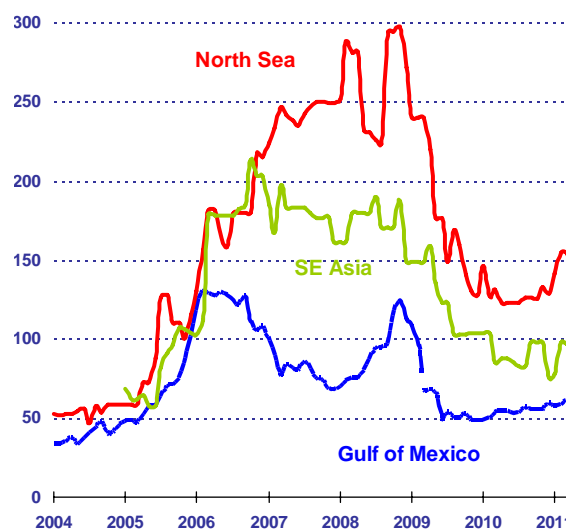
As a corollary of the fall in activity in Southeast Asia, rig rates throughout the region fell by 4 to 5% (for both jack-up and semi-submersible rigs).

**Figure 22: Semi-submersible rig rates (in thousands of \$/day) by geographic region**



Sources: IFP, ODS-Petrodata

**Figure 23: Jack-up rig rates (in thousands of \$/day) by geographic region**



### 2.2.2.2 Onshore and offshore drilling markets

The **onshore drilling market** recovered by 15% in 2010. This recovery continued over the first six months of 2011 and accelerated, with growth of 20%.

The **offshore drilling market** had shrunk by 8% in 2010. The offshore drilling market was not able to completely curb this fall over the first half of 2011 and continued to fall by 3%.

#### 2.2.2.2.1 A fast-growing onshore drilling market

Over the first six months of 2011, **the onshore drilling market rebounded by an estimated 20%**. Total turnover is expected to reach US\$22 billion for the year - after the market reeled from a 30% decline in 2009, in North America in particular. This growth is being aided by the increase of onshore rig rates in North America.

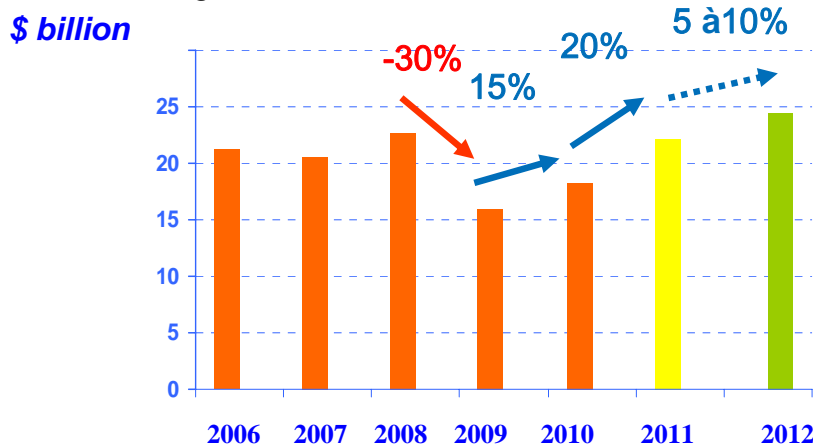
Five companies account for 50% of the world's onshore drilling market. The sector leader is Nabors Industries with an 18% share of the market, followed by Helmerich & Payne with 10% and Ensign Resource Services with 9%. Other companies together command less than 7% of the market.

**Table 2: Market share of the major onshore drilling companies in 2010**

<b>Onshore drilling companies</b>	<b>2010 market share in %</b>
Nabors Industries	18%
Helmerich & Payne	10%
Ensign Resource Services	9%
Precision Drilling Corp.	7%
Patterson-UTI Energy, Inc.	7%
Saipem SPA	6%
KCA/Deutag Drilling	3%
Unit Corporation	2%
Parker Drilling	1%
Rowan Companies	1%

In September 2011, Ensign Resource Services acquired Rowan Companies' onshore drilling division (Rowan Land Drilling). This will help it to strengthen its presence in the US.

**Figure 24: Onshore drilling market, estimates for 2011 and outlook for 2012**



Sources: IFP, Spears & Associates

**Looking ahead to 2012**, we can hope for a continuation of the market recovery, with growth in turnover of between 5% and 10%. As has been the case in 2011, growth should be driven by the development of shale oil reserves in the US.

#### 2.2.2.2.2 A recovering offshore drilling market

Over the first six months of 2011, **the market shrunk by 3%**. The Gulf of Mexico oil spill had already shaken the market in 2010, leading to a fall of 8%. The disaster led to a moratorium being implemented and a re-examination of the procedures for allocating licences. At the same time, the technical constraints for deep offshore and high-pressure drilling were tightened. Brazil and Norway - as well as other countries involved in deep offshore drilling - followed suit and also revised their conditions for granting licences.

**Table 3: Market share of the major offshore drilling companies in 2010**

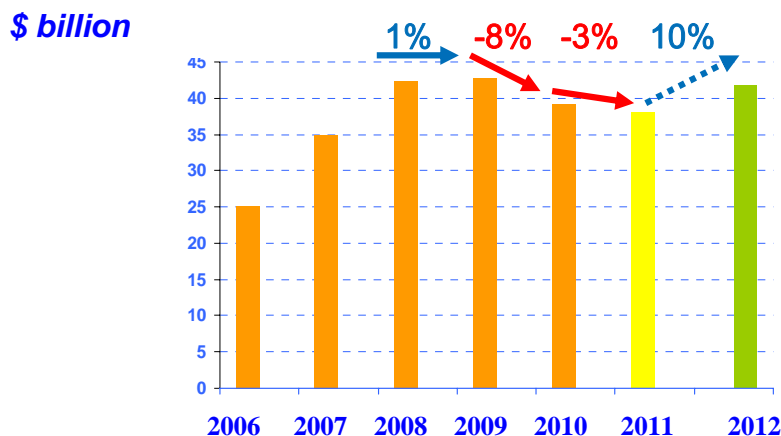
Offshore drilling companies	2010 market share in %
Transocean Inc.	22.4%
SeaDrill	9.5%
Diamond Offshore	7.6%
Noble Drilling	6.3%
ENSCO International, Inc.	4.0%
Pride International, Inc.	3.4%
COSL	3.2%
KCA/Deutag Drilling	2.6%
Dolphin Drilling	2.4%
Rowan Companies	2.4%
Saipem SPA	2.3%
Nabors Industries	1.6%
Atwood Oceanics	1.5%

Five companies share 50% of the world market. Transocean remains the leading company in the sector; but after the difficulties in the Gulf of Mexico, it has lost 5% of its world market

share. Of the five main offshore players, Seadrill is the only one to have increased its market share compared with 2009. Smaller companies, such as Saipem, have lost out as a result. ENSCO takeover of Pride has pushed it up to fourth place in terms of market share, just behind Diamond Offshore.

The effects of the moratorium have continued to be felt into 2011. Drilling activity has only been recovering since February - and only slowly. Between February and July, the rate at which drilling licences were being issued was half that of 2009. The situation should improve in 2012.

**Figure 25: Offshore drilling market, estimates for 2009 and outlook for 2010**



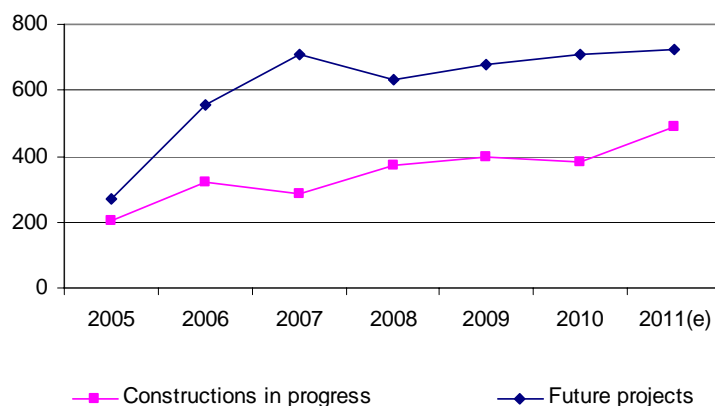
Sources: IFP, Spears & Associates

## 2.2.3 Offshore construction

### 2.2.3.1 Rapidly growing activity

After 2010 which saw a slight fall of 4%, the first half of 2011 showed a clear recovery across all types of offshore platforms (fixed, floating and sub-sea) of around 30%.

**Figure 26: Offshore constructions in progress and future projects for the period 2005-2011**



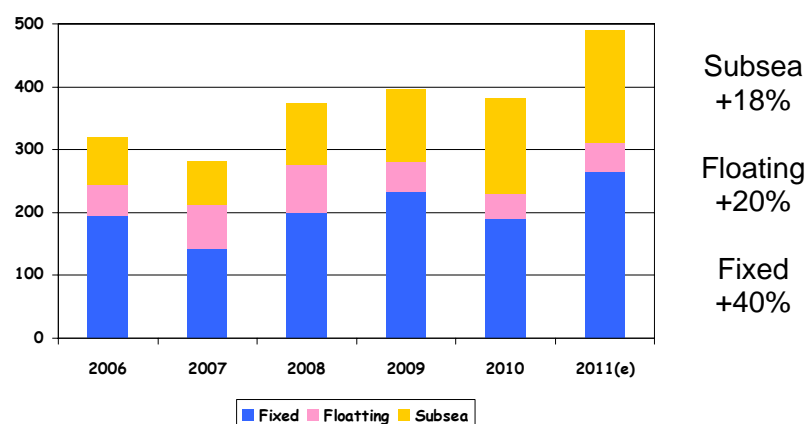
The number of offshore constructions has been growing at an average rate of 15% per year since 2005. The world financial and economic crisis resulted in activity stagnating in 2010 and a reduction in the increase in the numbers of future projects, which fell to under 5% per year after 2008.

Over the first six months of 2011, the number of **fixed platforms** being built increased significantly - by 40%. This was a sign of a revival of interest in developing shallower zones, but above all it was a sign of a recovery - the number of platforms being built had fallen by 20% in 2010.

The number of **floating platforms** being built also recovered, increasing by 20% over the first half of 2011 - having fallen dramatically in 2009 and 2010 (by 35% and 20%, respectively).

The increase in the number of **subsea installations** is continuing, with an estimated 18% growth over 2011. They had not been affected by the financial crisis over the two previous years, increasing by 18% in 2009 and 20% in 2010.

**Figure 27: Number of offshore constructions by type**



As far as **future projects** are concerned, the increase in the number of fixed platforms is expected to slow down in 2011, with 9% fewer projects than in 2010.

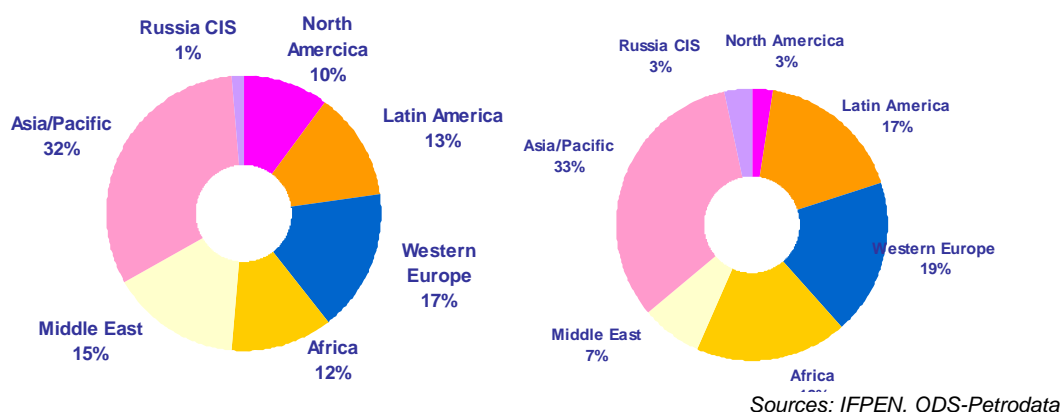
The numbers of planned floating platforms should increase dramatically (by 30%), making up for the delays over the two previous years.

The numbers of subsea installations being built should continue to increase over 2011 by 8%, as was the case the previous year.

An estimated 490 constructions were under way in 2011, the majority of which were fixed platforms (35%), subsea installations (35%) and floating platforms (10%).

And a further 720 installations are planned for the years ahead (as identified in 2011). Half of these will be fixed platforms, a third will be subsea installations and nearly 20% will be floating platforms.

**Figure 28: Geographic distribution of offshore constructions in 2011 (estimate)**      **Figure 29: Geographic distribution of planned installations beyond 2011 (estimate)**



#### • Activity by geographic region

Activity has increased for all types of constructions and across all geographic regions - except Russia and CIS. The major centres of offshore construction are as follows:

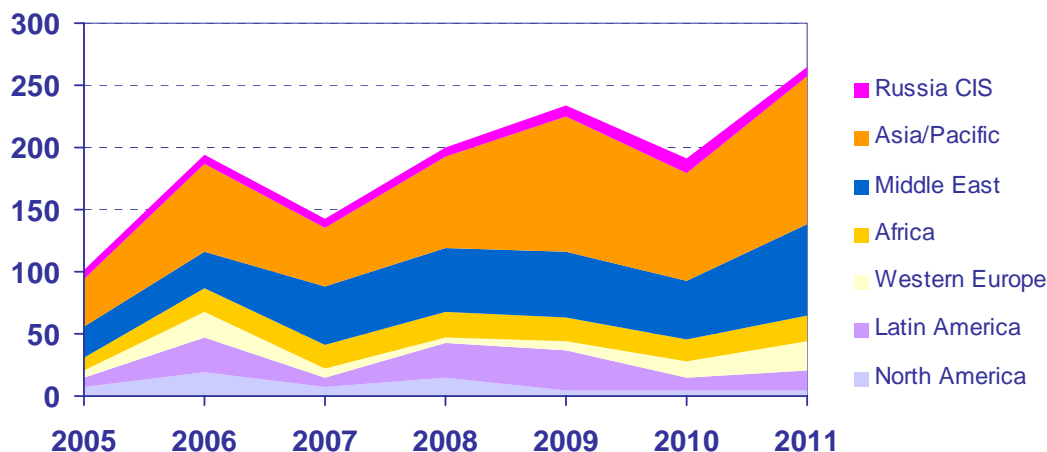
- **Asia-Pacific** (32%), Southeast Asia and India in particular, where growth for 2011 should be in the order of 75% and 50%, respectively.
- **the Middle East** (15%), where mainly fixed platforms have been built, should see growth in excess of 50% for 2011.
- **West Africa** (12%), the Gulf of Guinea in particular, where mainly fixed platforms and many subsea installations have been built. Construction in this region should remain relatively stable throughout 2011, having increased dramatically in 2010 (27%).
- **Western Europe** (17%) and the North Sea where activity continues to increase, compensating for the fall in production. According to the Norwegian Petroleum Directorate, 8 fields should come into production between 2011 and 2014 (Goliat, Gudrun, Marulk, Oselvar, Skarv, Tym and Yme). 2011 should once again see a strong increase in activity (40%), after a 34% increase in 2010.
- **Latin America**, including Brazil which is continuing to develop its giant fields, should see growth of 17% in 2011.
- the **Gulf of Mexico** (10%) which - despite the moratorium on offshore drilling - authorised the resumption of drilling activity for companies which had already secured authorisation for the development of fields. It should see a 30% increase in offshore construction.
- **Russia and the CIS** (1%) is the only region which looks set to see a decline in activity in 2011, with only 7 offshore installations built - a fall of 35% compared with 2010.

As far as the geographic distribution of future projects is concerned, there are disproportionately fewer in the Gulf of Mexico and the Middle East, which account for 3% and 7% respectively of all future installations - considerably less than their existing facilities.

- **Fixed platforms**

After a 20% fall in activity over 2010, the first half of 2011 saw a recovery of 40% for the construction of fixed platforms. This increase can be explained by activity in shallow areas having been postponed, particularly and above all in the Gulf of Mexico. The number of fixed platforms being built in the Gulf of Mexico in 2011 should increase by 33%.

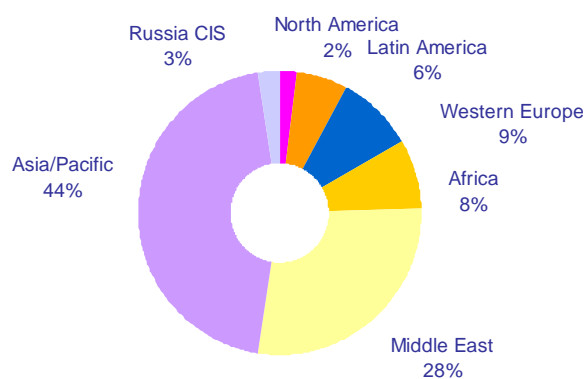
**Figure 30: Number of fixed platforms built since 2005**



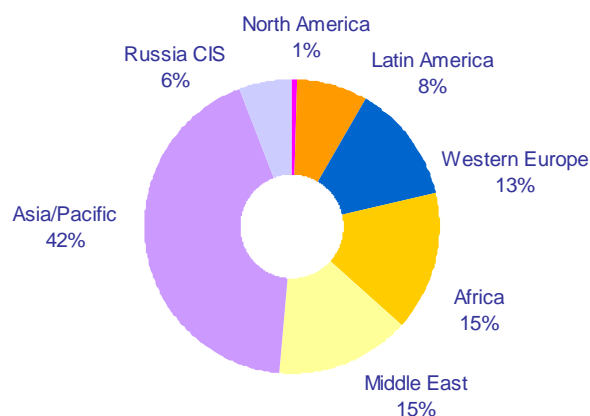
This platform type is particularly popular in the Asia-Pacific region and in the Middle East. These two regions account for 45% and 28% respectively of worldwide activity, and together account for three quarters of all fixed platforms built all over the world. The three other geographic regions where this type of platform is particularly used are western Europe, Africa and Latin America, accounting for 9%, 8% and 6%, respectively.

Western Europe should double its activity over 2011, with Southeast Asia and Latin America also enjoying strong growth (64% and 53%, respectively). The Far East, Russia and the Caspian Sea, Australia and New Zealand have all seen a decline in the numbers of fixed platforms being built (44%, 33% and 25%, respectively).

**Figure 31: Number of fixed platforms built in 2011 (estimate)**



**Figure 32: Number of future fixed platforms to be built beyond 2011 (estimate)**



Sources: IFP, ODS-Petrodata

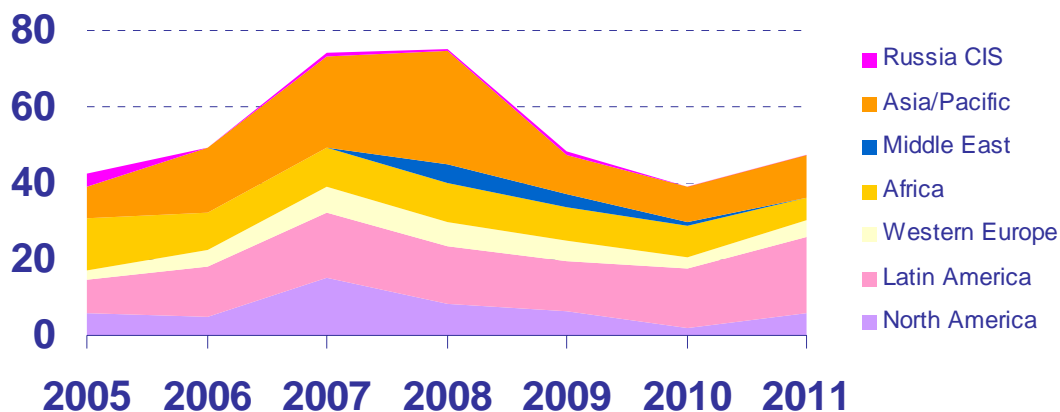
In terms of platforms to be built beyond 2011, it should be pointed out that there was a general decline of 9% over the first half of 2011. However, the Gulf of Mexico and Russia and the Caspian Sea saw declines of 50% and 44%, respectively. Brazil alone has seen an increase in the numbers of installations being built (percent).

- **Floating platforms**

Over the first half of 2011, the number of floating platforms being built increased by 20% - having fallen for two years in a row in 2009 and 2010 (by 35% and 20%, respectively).

This type of production facility - which includes semi-submersibles and Floating Production Storage and Offloading facilities (FPSO) - is used to exploit fields at depths of more than 300 m. However, it only accounts for 12% or so of worldwide offshore constructions.

**Figure 33: Number of floating platforms constructed since 2005**



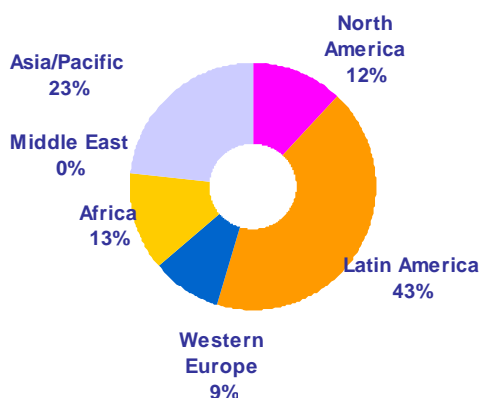
Sources: IFP, ODS-Petrodata

Most of the world's floating platforms are being built in Latin America (43%), Southeast Asia (17%) and the Gulf of Mexico (12%). Africa and Western Europe both account for 9%.

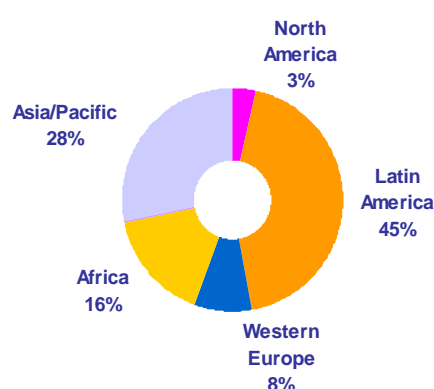
The most significant increase has been in the Gulf of Mexico: in 2010, construction had fallen by 2 units as a result of the moratorium on deep offshore drilling. But 2011 should see a return to 2009 levels of activity - around 6 units.

Activity has increased across all geographic regions - 40% in Western Europe, 30% in both Latin America and Southeast Asia. Only Africa has seen a decline (-20%). These types of installation are being abandoned in the Gulf of Mexico in favour of subsea developments.

**Figure 34 Number of floating platforms built in 2011 (estimate)**



**Figure 35: Number of future floating platforms to be built beyond 2011 (estimate)**



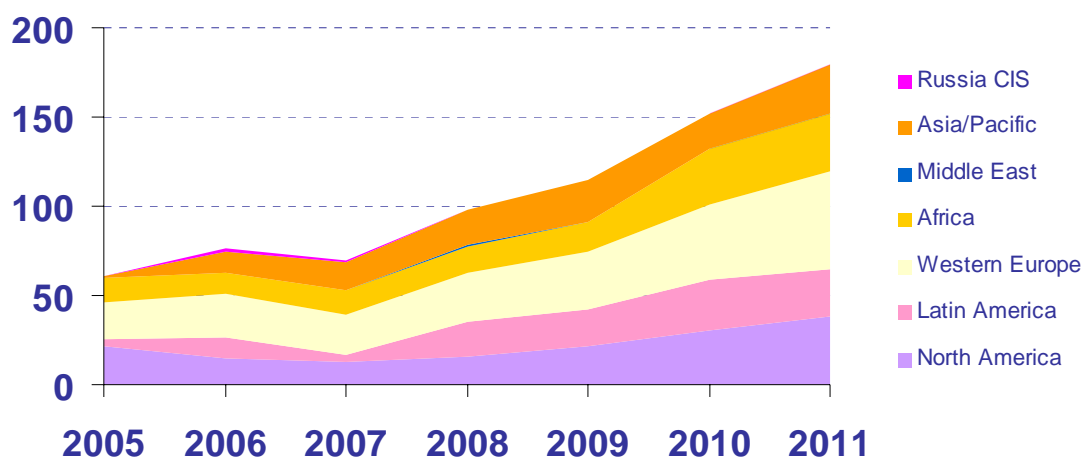
There has been an increase of 34% in the numbers of projects scheduled for beyond 2011. This increase has been seen in all regions throughout the world, except the Gulf of Mexico (which has seen a fall of 10%). The regions that are seeing the highest growth rates are Latin America (50%) and Africa (45%).

- **Subsea installations**

The increase in the number of subsea installations is continuing, with an estimated 18% growth over 2011. They had not been affected by the financial crisis over the two previous years, increasing by 18% in 2009 and 20% in 2010.

One advantage of these installations is that the wellheads of remote fields can be connected to an existing production platforms via an underwater link. They are used in particular to develop satellite fields or existing production platforms. But they are also used to pool costs for major regional operations: a single floating production platform can be used to develop several large-scale fields.

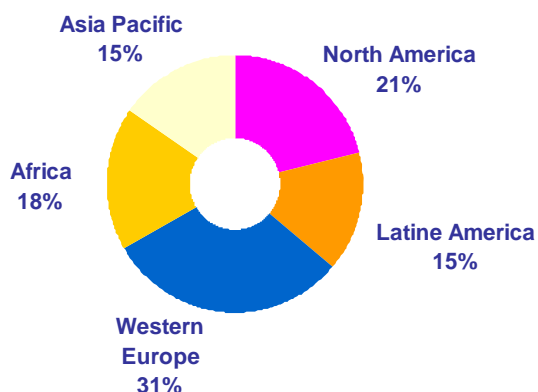
**Figure 36: Number of subsea construction projects since 2005**



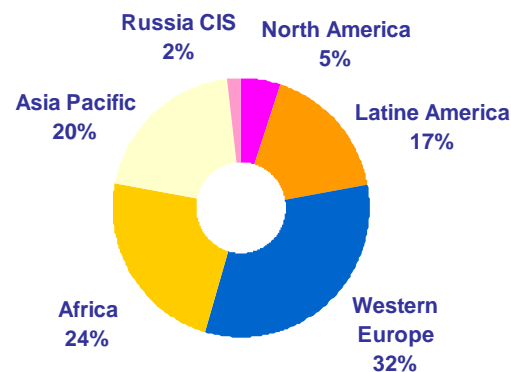
Over the first half of 2011, Western Europe accounted for 30% of all subsea construction projects - mainly for developing satellite fields in the North Sea. The Gulf of Mexico accounted for 20% of all subsea construction projects. West Africa accounted for 18%, Latin America with Brazil for 15%. Development activities in Australia and New Zealand accounted for 6% of worldwide subsea developments.

Only the Middle East and Russia and the Caspian Sea region have no offshore developments of this type.

**Figure 37: Number of subsea infrastructure construction projects in 2011 (estimate)**



**Figure 38: Number of future subsea infrastructure projects to be built beyond 2011 (estimate)**



Sources: IFP, ODS-Petrodata

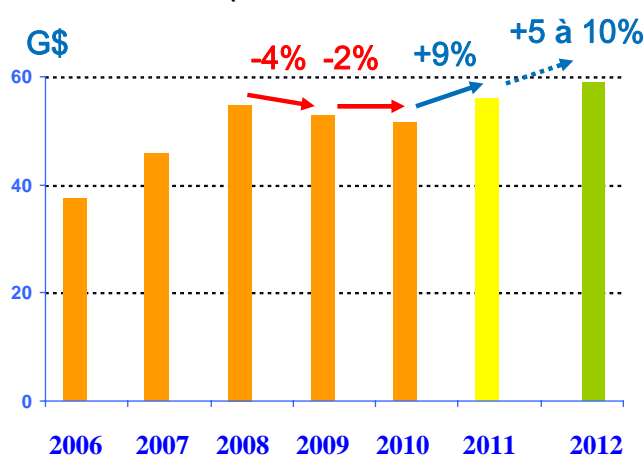
As far as subsea infrastructure projects scheduled for beyond 2011 are concerned, the growth in activity for 2010 should be 8%, with Southeast Asia and India seeing the highest growth in the numbers of projects (130% and 50%, respectively).

### 2.2.3.2 An overall increase in total revenue

Revenues in the offshore construction market doubled between 2005 and 2008, thanks to several years of strong growth that pushed turnover from \$27 billion up to more than \$50 billion. This momentum was halted by the world financial crisis in 2009, triggering two years of decline (4% and 2%).

The first half of 2011 indicates a clear change in trend. The market should recover by 9% in 2011, with turnover of \$55 billion, similar to the situation before the crisis.

**Figure 39: Offshore construction market (estimated for 2011 and outlook for 2012)**



Sources: IFP

Five companies account for 50% of the world's offshore construction market.

**Table 4: Market share of the major offshore construction companies in 2010**

Offshore construction companies	2010 market share in %
Aker Solutions	14%
Saipem	12%
Technip	10%
FMC Technologies	8%
SBM Offshore	6%
KBR	6%
Mc Dermott International	5%
Acergy	5%
Subsea	4%
Helix Energy Solutions	2%
Oceaneering	2%
Cal Dive	1%
Global Industries	1%

### 2.2.3.3 Deep offshore prospects still favourable

The recovery should continue into 2012. The main players on the market have seen a 20% increase in orders compared with last year. The increase in the numbers of subsea installations (a segment of the market that generates both margin and growth) should be particularly strong. Those companies whose presence on this market accounts for a significant share of the overall activity are seeing particularly strong growth in their numbers of orders: + 57% for the new Subsea/Acergy entity, +74% for FMC.

As far as pollution and emissions are concerned, the constraints are set to get even tighter for oil companies, particularly in the wake of problems to do with production incidents:

- **Shell** may well be prosecuted for leaks of crude oil into the North Sea in the Gannet Alpha field. Investigations are already under way.
- **ConocoPhillips** has had to cease operations at its largest offshore field in China - the Chinese authorities are not satisfied with how well an oil leak has been sealed in the Gulf of Bohai.

### Mergers and acquisitions 2011

Acergy's acquisition of Subsea 7 took effect in January 2011. The new entity now has 40 ships. It can operate at all levels of subsea construction, engineering, building and services.

Technip is taking control of Global Industries (specialised in the development of subsea fields) via a non-hostile public takeover bid. Technip will gain access to Global Industries' 16 pipe-laying ships, which - because of the moratorium in the Gulf of Mexico - have utilisation rates of less than 30%.

## 2.3 Conclusion

The recovery in exploration and production investment that began in 2010 continued and strengthened into 2011. The increase in activity became stronger for all the main segments of the upstream oil services sector. Having remained depressed in 2010 as a result of the low prices brought on by on-going overcapacity, the oil services markets started to grow again in 2011 - with the exception of offshore drilling, which is still being affected by the situation in the Gulf of Mexico. A return to pre-Macondo oil spill levels is not expected until 2012.

Driven by high oil prices, the sums that oil companies are investing in exploration and production should reach a record high this year of more than \$540 billion - an increase of 15% compared with the previous year.

This increase should continue into 2012, with significant onshore developments in the US (shale oil and gas), Brazilian offshore, LNG projects in Australia and the development of fields in Iraq. The oil services sector should also be able to take advantage of this growth - the prices of services and equipment are also all starting to rise again.

**Table 5: Summary table of the change in investments and markets analysed**

	2010	2011	2012
<b>E&amp;P investment</b>	<b>13%</b>	<b>15%</b>	<b>5 to 10%</b>
North America	37%	16%	
Rest of the world	6%	15%	
<b>Geophysics market</b>	<b>-5%</b>	<b>+7%</b>	<b>5 to 10%</b>
<b>Drilling market</b>			
onshore	+15%	+20%	5 to 10%
offshore	-8%	-3%	+10%
<b>Offshore construction market</b>	<b>-2%</b>	<b>+9%</b>	<b>5 to 10%</b>

### 3 Refining: mature/emerging markets, multiple stakes

Following the world economic crisis of 2008/2009 which saw the refining sector in serious difficulty, overall, 2010 looks like a healthier year. World demand picking up resulted in a decline in overcapacity (this was driven by a number of major construction projects being postponed) and in better utilisation rates for refineries. This went some way towards helping refining margins to recover - although they are still at somewhat mediocre levels after their historic low at the end of 2009. This in turn led to a slight recovery in the financial results of these companies. Overall expenditure in the refining sector remained stable throughout 2010 in a climate that was still difficult as a result of the delayed effects of the crisis.

Following a start to 2011 that was very much in the same vein as the previous year, there was a re-emergence of overcapacity, resulting from both a slowdown in demand and a recovery in new capacity projects. This development will not help the general recovery of margins for there to be sufficient profitability: new closures have been announced and there have been difficulties in finding purchasers for the assets for sale.

In the world's industrialised countries, the outlook beyond 2011 is not very encouraging for the refiners in order to invest significant sums of money, keep pace with changes in regulations (sulphur content of marine fuels, CO<sub>2</sub> quotas, etc.), as a result of minimum levels being maintained, overcapacities and the prospect of low refining margins. The strategy that many companies are currently adopting involves discontinuing their downstream activities and this seems to be increasingly common. It is evidence of investors losing long-term confidence in refining activities. The investments that are being made in the world's industrialised countries are moving towards increased complexity and flexibility, and less new capacity. The new macroeconomic factors which emerged during the second half of 2011 - including the sovereign debt crisis - and the more restrictive policies which will ensue as a result will further hinder refining activities in the world's industrialised countries, in US and Europe in particular.

The situation in the world's emerging countries is very different. Up until now, they have been relatively unaffected by the crisis. Their domestic requirements are increasing and the construction of new capacity is keeping pace with growth in demand. Some operators are even getting involved in exports, resulting in a strengthening of the market's surplus status that will endure for at least the near future. In terms of investments, emerging countries are still focussed on investments in terms of capacity and complexity. This is so as to keep pace with growth in their demand, while at the same time meeting environmental requirements, mainly in relation to product quality.

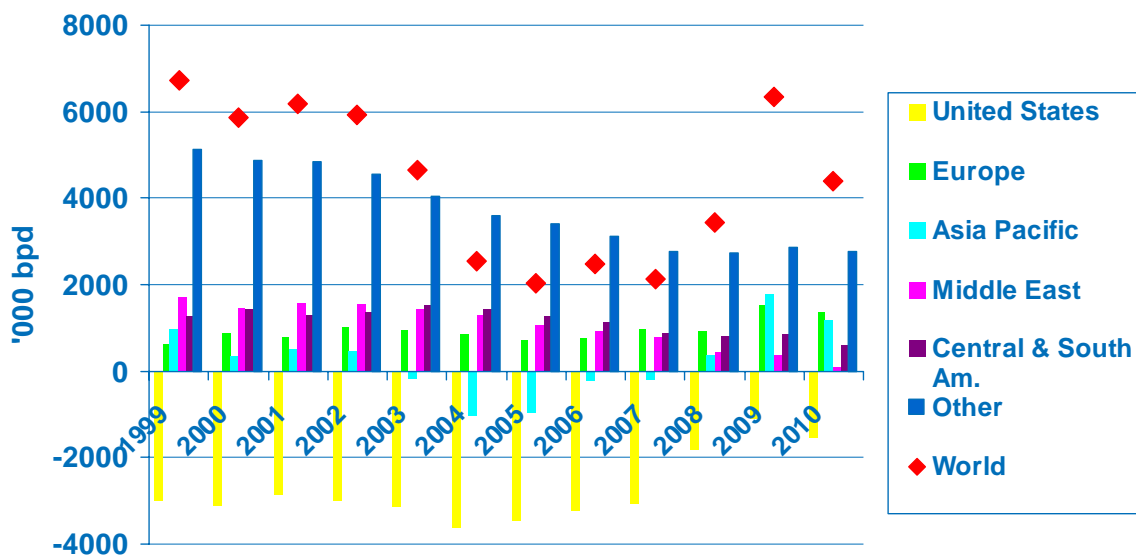
As far as oil producing countries are concerned, the situation is relatively similar to the one in which emerging countries find themselves in terms of investment. While guaranteeing the supply of their fast-growing domestic market, their strategy also involves export markets (major export refinery projects).

#### 3.1 After a break, the global refinery overcapacity worsens

**2010** was marked by a fall in global refinery overcapacity from 6.4 mbd in 2009 to 4.4 mbd in 2010. This followed two years of considerable increase resulting from a significant fall in demand. The recovery in demand in 2010 (3.2% according to the IEA, pushing up to 88.3 mbd), driven by an economic recovery of sorts in the world's industrialised countries and by uninterrupted growth in India and China, is behind this change in trend. The economic and financial crisis of 2008 had not had a dramatic effect on change in refining capacity at global level. This capacity has continued to increase. The global situation obviously hides specific situations in different regions across the world which are extremely contrasted.

All the regions posted surplus, except for the US which increased its level of dependency on its refining capacity: demand increased for the first time since 2006 (2%), while refining capacity fell slightly. The rise in the demand affected middle distillates (4%) and heavy fuel (7.7%) in particular, as well as all other products<sup>1</sup>. This also led to an increase in refinery utilisation rates - without recourse to investing in new refinery capacity.

**Figure 40: Refining capacity surplus/shortage, by major region**



Source: IFP, based on the BP Statistical Review of World Energy 2010

In the Asia-Pacific region, after an exceptional year in 2009 (6% growth) buoyed by the giant Jamnagar SEZ refinery coming into operation in India (580 kb/d), the quantity of new capacity being installed returned to more moderate growth (although still high at 2.7%) compared with other regions across the world, more in line with mid-term change. At the same time, after two years of relative stability, oil demand increased dramatically (5.3%), resulting in a reasonable level of overcapacity (1.1 mbd). The acceleration in demand was met by both higher refinery utilisation rates (84%) and - in particular - investments in new capacity being stepped up (2.7%). China, the undisputed leader in this region, once again turned in a remarkable performance: demand rose by 10.4%, while refining capacity declined slightly (6.8% compared with 8.7% the year before). Like the Asia-Pacific region, China has resorted to investing in new capacity, but has also been using its existing refining facilities more intensively in order to compensate for the high increase in its demand.

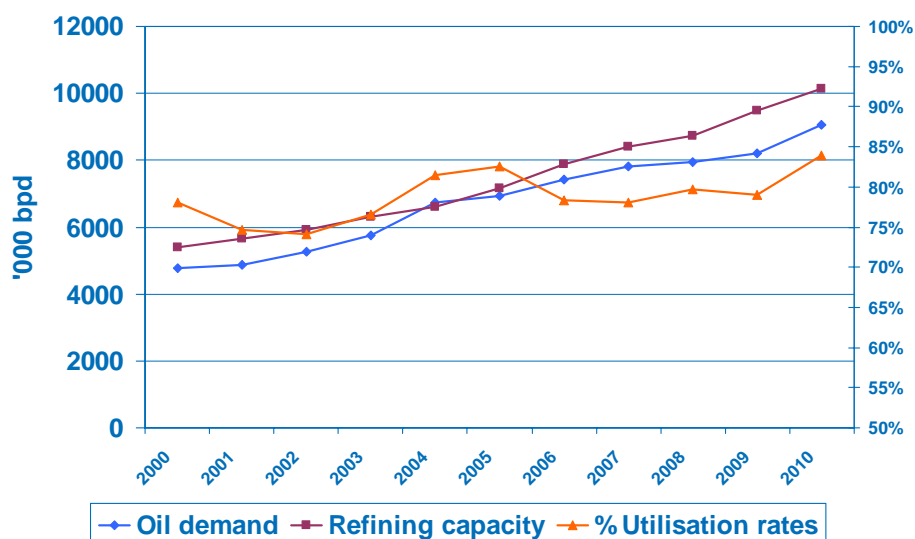
Europe is the only region to have seen a fall in both demand (-0.9%) and refining capacity (-2%) in 2010, the largest decline resulting in a new increase in capacity surplus in 2010 - despite a slight improvement in utilisation rates, rising 1% to 82.6%. The challenges facing Europe's refining sector - particularly in France - have not changed: it must find an economic balance between petrol surplus at a time when consumption, particularly in the US (the main destination for these surpluses) is running the risk of slowing in the future, and middle distillates in order to offset a structural shortage of refining infrastructure. In 2010, which saw a general decline in demand in the region, only consumption of middle distillates - jet fuel, kerosene and diesel - increased slightly (1.6%).

The Middle East is succeeding in reaching a balance between refining capacity and demand, with growth in demand having been consistently higher for a decade now: consumption has

<sup>1</sup> petrol consumption, feeling the impact of policies to promote energy efficiency and biofuels, still increased by 0.5%

risen 66% since 2000, whereas refining capacity has "only" risen 22% over the same period.<sup>2</sup>.

**Figure 41: Oil demand, refining capacity and refinery utilisation rates in China**



Source: IFP, based on the BP Statistical Review of World Energy 2010

In Central and South America, the surplus situation in 2010 is similar to the situation which prevailed the previous year, with refining capacity holding steady and a slight increase in demand. The significant fall in utilisation rates - a fall of more than 12% in two years, from 81% in 2008 to 69% in 2010 - was compensated for by product imports in particular (37% between 2009 and 2010). Elsewhere, the Russian Federation in particular reported major surpluses, despite a very strong rise in its demand (9.2%). Russia is an exporter of products, mainly middle distillates to Europe.

At global level, refining capacity surplus fell by 2 mbd in 2010. This development can be explained more by the relatively strong recovery in demand - after two years of decline in the US and Europe in particular - than by a change in capacity. The increase in refinery utilisation rates has gone a long way towards meeting the new rise in demand. Now, as far as both demand and investment in new capacity are concerned, the Asia-Pacific region (through China in particular and - to a lesser extent - the Middle East) are driving growth in this sector. It should also be pointed out that the BRIC countries, which include Brazil and Russia - as well as India and China - are among the principal nations driving the world economy, with an 8.6% increase in oil demand and a 4% increase in refining capacity in 2010.

In its annual report published in August, the IEA predicts a slowdown in demand for **2011** (1.4%), due to a weakening of the world economy and high crude oil prices (although the trend reversed in May). Refining capacity at world level should continue to rise at the same rate as demand, given the various projects which have been scheduled, leaving a surplus of 3.6 mbd, down from 2010. The emerging and producer countries are reinforcing their role as drivers of this growth. In the mid-term, economic growth predictions will confirm the current trend - i.e., the relocation of refining activities towards emerging regions with high oil demand.

- The sovereign debt crises affecting many **industrialised countries** which came to light in summer 2011 and the various budgetary readjustment policies that have resulted from it will all accelerate this trend. The weak growth that will follow in Europe, the US and

<sup>2</sup> The atypical situation in Saudi Arabia should be noted, where oil is used directly for the country's electricity generation requirements. This has a tendency to inflate data about domestic consumption

Japan will hinder any recovery in demand and so will adversely affect initiatives to invest in new capacity. The process of reducing capacity - alongside a restructuring of refining facilities - which began in the world's industrialised countries (Europe and US in particular), driven by the structural slowdown in demand and competition from imports of middle distillates from Russia and Asia, will be stepped up.

- Conversely, the world's **emerging countries** - which are driving growth and consuming energy - are now an ideal environment within which to develop refining activities. More refining capacity will be installed in these countries in the years to come so as to meet domestic and foreign requirements for oil products. In the Middle East, the aim is to produce better quality products, particularly in Saudi Arabia and Abu Dhabi starting in 2014, where the new refineries will be more geared towards producing low sulphur content products for the external market. Similar projects are under way in Brazil. These various investments may have a significant influence on the future market of the Atlantic basin. In Asia, China will continue to keep pace with its domestic demand and India is intending to continue its strategy of exporting towards Asia, West Africa and Europe. Other countries, such as Indonesia, Vietnam and Malaysia, are continuing with their programmes to expand their refining capacity - mainly in a bid to meet their domestic demand.

In addition to economic criteria, industrialised countries are now going to have to tackle increasingly severe regulatory considerations:

- In the US, refiners are going to have to meet the requirements of ultra-low sulphur petrol, reducing the content from the current 30 ppm level to 10 ppm. They are going to have to reduce the vapour pressure of petrol, leading to a surplus of the lighter cuts. And marine fuel emissions levels are going to be brought down (sulphur content) in the emission control areas of North America by 2015.
- In Europe, most efforts are going to be focused on reducing emissions from marine fuels and on complying with the mandatory reductions of CO<sub>2</sub> emissions (bids). This will start when Phase III of the community system for trading greenhouse gas emission quotas comes into effect in 2013<sup>3</sup>.

### 3.2 Precarious recovery of refining margins

The drop in demand and the worldwide increase in refining capacity had a devastating effect on refining margins in 2009, which fell to levels that could not easily be sustained beyond the short-term<sup>4</sup>.

The attendance was reversed in **2010** and margins started to recover. After a two-year decline, demand increased to a level above its 2007 level. This, together with a slowdown in the numbers of new refinery construction projects and a recovery in the utilisation rates of existing refineries created a situation which helped margins recover. This was particularly noticeable in Asia - evidence of just how strong the economic recovery in this part of the region has been, a trend which continued into 2011. However, despite a clear recovery getting under way from 2010 onwards, margins remain weak.

More periodically, the improvement in margins that was seen in 2010 can also be explained by price differentials and - in particular - by crack spreads performing better than middle distillates. On the Asian market, for example (Singapore), crack spread on diesel increased by \$3.75 a barrel between 2009 and 2010. Its value increased by \$2.3 a barrel in north-west Europe and by \$1.8 a barrel on the US Gulf market, while the price premium on petrol was

<sup>3</sup> Emissions permits will be allocated on a weighted basis depending on complexity; the most efficient refiners will pay no supplements, others will pay for their CO<sub>2</sub> emissions in accordance with a sliding scale. This will put pressure on the least efficient refiners.

<sup>4</sup> refining margins temporarily fell to below operating costs

\$2.5 a barrel on the Asian market (Singapore), \$4.2 a barrel in Europe and \$3 a barrel on the US Gulf market. The bonuses on crack spread on diesel compared with petrol resulted in refiners maximising their production of middle distillates - as they did during the buoyant years between 2004 and 2008.

Other factors not directly linked to prices resulted in an overall strengthening of margins in 2010:

- there were unplanned interruptions to work in a number of Asian refineries in the first quarter (Indonesia and Vietnam); an unusual number of seasonal maintenance shutdowns in the second quarter, together with the introduction of new (tighter) specifications for petrol in India which local refiners were unable to produce, forcing the government to resort to imports; unexpected extra demand for diesel in China (for electricity generation) in the last quarter. At a more global level, the increase in the price differential between regional benchmark crudes - Brent and Dubai - is an additional factor which has boosted Asian margins.
- on the European market, there was a strike at Total refineries in France during the first quarter of the year. There was also an unusual number of seasonal maintenance shutdowns in the second quarter (as was the case in Asia), and a strike at ports and refineries in France in October
- in US, there was unusually cold weather for a long period of time.

In **2011**, margins increased on the LLS cracking and Dubai cracking markets, rising by \$0.16 per barrel to \$1.77 per barrel and from -\$0.48 per barrel to \$1.04 per barrel respectively between 2010 and 2011 (over the first 8 months of the year). As far as the US market is concerned, margins became positive in April, sustained by higher crack spreads on petrol. A number of factors helped increase the petrol-crude oil differential: the low price of WTI, together with petrol prices in US, variations in which kept pace more with the price of Brent (very high Brent-WTI differential), a fall in the number of stocks<sup>5</sup> and the unscheduled shutdown of a number of refineries. In addition to these factors, there were also the traditional seasonal fears to do with the increase in petrol demand during the "driving season".

**Table 6: Complex refining margins (annual average in billions of \$)**

	2003	2004	2005	2006	2007	2008	2009	2010	2011 (p)**
Brent-Cracking (NW Europe)	2.34	3.77	4.98	4.04	5.09	4.90	1.22	2.30	0.50
LLS* Cracking US "Gulf Coast")	1.12	1.69	5.37	5.21	4.83	2.18	-0.23	-0.48	1.04
Dubai Hydrocracking. (Singapore)	0.82	3.74	3.96	2.19	3.47	3.06	-1.52	0.16	1.77

\* Light Louisiana Sweet; \*\* average over the first 8 months of the year.

Source: Oil Market Report (IEA), IFP Énergies nouvelles

In Asia, having increased continuously throughout 2010, margins fluctuated between \$1 a barrel and \$2.4 a barrel, influenced by opposing trends between the declining crack spread on petrol (versus Dubai) and the increase in crack spreads on middle distillates<sup>6</sup> and fuel oil.

On the European market, margins tended to fall, driven down by the price of Brent, falling from \$2.30 per barrel to \$0.5 per barrel between 2009 and 2010. After a difficult first quarter because of the low differential on the price of petrol, margins started to climb again in the spring, driven by differentials on the price of diesel and an improvement in the differentials on

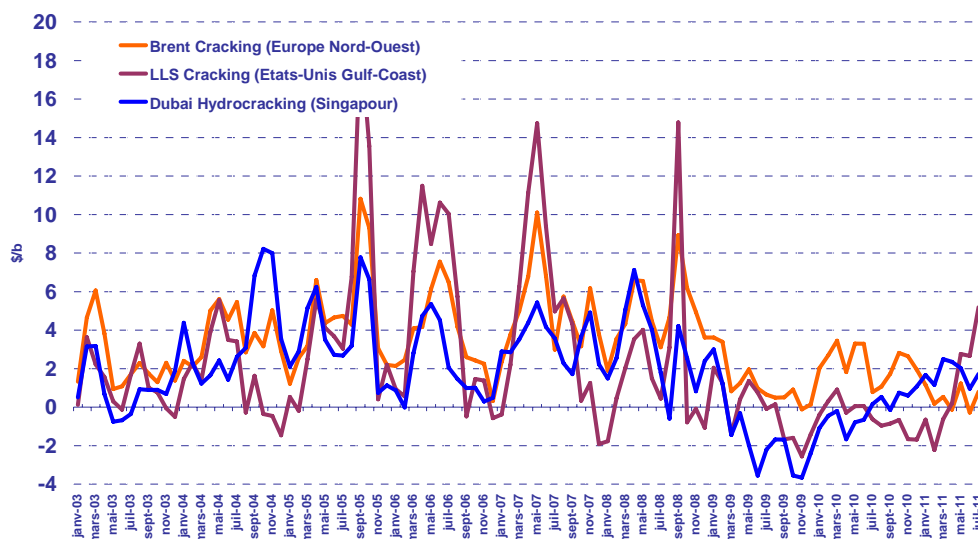
<sup>5</sup> A power cut in Texas resulted in the temporary shutdown of around 5% of total US refining capacity, leading to fears of a petrol shortage

<sup>6</sup> Chinese demand for diesel remained high, driven by electricity shortages in at least 10 provinces.

the price of petrol. Overall, margins remained low, falling to \$0.8 per barrel on the European market in August (Brent-cracking).

Overall, we can expect these low margins to hold - or even decline further - throughout 2011, weakened by the expected slowdown in demand, by a recovery in the numbers of new refinery facilities being built, via the likely fall in refinery utilisation rates and by crude oil prices remaining high (particularly in the Brent reference region).

**Figure 42: Change in refining margins since 2003 (in billions of \$)**



Source: Oil Market Report (IEA), IFP Énergies nouvelles

The likelihood of margins recovering to their 2004-2008 levels by 2012 is very low. And the situation is not likely to undergo any fundamental changes in 2013. Despite the stability and high potential of China (and of the world's emerging countries more generally) in terms of demand, other high-energy consuming countries, such as those of the OECD, are tending to adopt policies that encourage people to consume less and more efficiently. And in addition to these well-known factors, the danger of the sovereign debt crisis in the world's industrialised countries this year should be taken into consideration. Against this new backdrop of budgetary austerity, demand is once again running the risk of declining.

### 3.3 Mixed net results

It is worth remembering that in 2009 the repercussions of the crisis were strongly felt by oil companies, whose refining divisions reported substantially worse financial results. The average decline for all companies was 67%, with larger shortfalls among US companies (down 86%) than European firms (down 40%). These results reflect the collapse in refining margins to their lowest point in 2009.

There was a steady improvement in **2010**, thanks to a relative recovery in demand and improving refining margins. All the companies under review improved their results. Some posted significant improvements, such as Chevron, ConocoPhillips, ExxonMobil, Tesoro and Valero in the US (Tesoro and Valero only operate in the downstream oil sector), and BP and Shell in Europe. In addition to improving its performance, Chevron also posted a one-time gain of \$400 million generated by the sale of refining assets. It also received the green light from the government to transfer its refining and distribution activities to the UK and Ireland, in line with its policy to "lighten" its downstream assets. ConocoPhillips was able to take advantage of its positioning on the US market (its main market), which saw a recovery in demand in 2010. British company BP has used a number of strategies, such as selling its

assets<sup>7</sup>, a utilisation rate which is significantly above average for the industry and a considerable recovery in refining volumes (+139 mbd). Shell is also using its policy of re-centring its refining activities, selling its smaller, more isolated refineries and concentrating on its larger ones<sup>8</sup>. Overall, healthier economic conditions in 2010 are the reasons behind this improvement in the results of "pure" refining companies. Noteworthy are the results of Sunoco which was back in credit throughout 2010. Only the Italian company ENI made a loss, despite an improvement in its results.

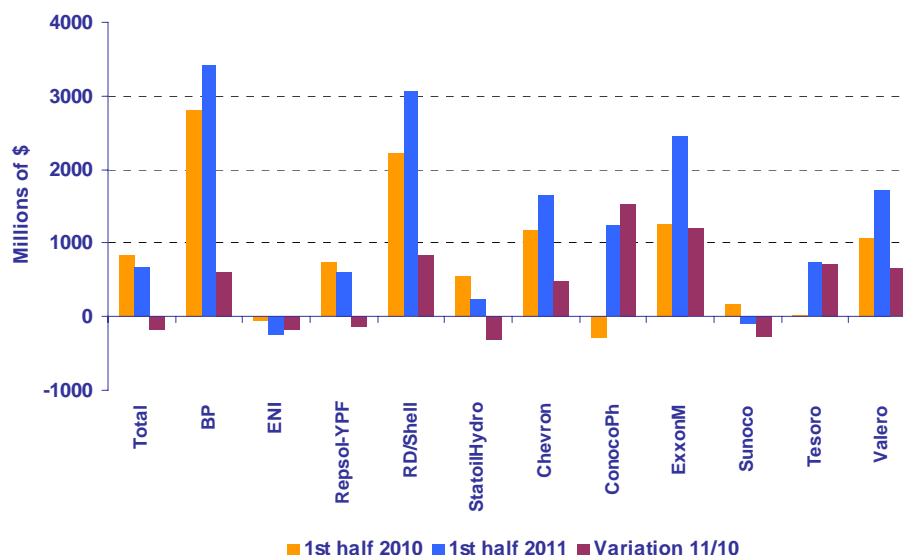
**Table 7: Net corporate income in the refining-distribution sector (in millions of \$)**

	Difference in \$M 1S11 and 1S10	2010	2009	Percentage variation 2010/09
Total	-185 (-22%)	1551	1329	17
BP	613 (22%)	5555	743	x 7.5
ENI	-182 (ns)	-65	-275	ns
Repsol-YPF	-136 (-18%)	1731	1425	21
RD/Shell	839 (38%)	4448	3054	46
Statoil	-315 (-57%)	514	368	40
Chevron	495 (42%)	2478	473	424
ConocoPhillips	1531 (ns)	192	37	419
ExxonMobil	1198 (95%)	3567	1781	100
Sunoco	-276 (ns)	102	-227	ns
Tesoro	707 (X 21)	352	138	155
Valero	661 (62%)	1876	83	x 23

Source: annual reports and BIP.

ns: not significant

**Figure 43: Net corporate income in the refining-distribution sector (in millions of \$) First six months 2010-2011**



Source: IFP

<sup>7</sup> This trend will continue and become more pronounced into 2011 and 2012, with the continuation of its drive to restructure its operations in the downstream oil sector in the US where it is intending to sell two of its refineries (in Texas and Carlson), together with the distribution networks associated with them. After the sales, the group's refining capacity in the US should fall by half.

<sup>8</sup> In 2010, Shell sold US\$7 billion worth of its facilities (\$30 billion over the last 5 years).

There was an improvement in **2011**, sustained by a consolidation in demand and refining margins, particularly on the US market. During the course of the first half of the year, the overall results for all companies under review improved significantly, 50% higher than the results for the previous year. This improvement is due in particular to US companies who have been able to take advantage of improvements in fundamentals on the North American continent. The situation has been less encouraging in Europe, with margins falling and lower refinery availability rates as a result of maintenance shutdowns.

### 3.4 Refining industry spending resumes

Whereas 2010 was marked by a slowdown in overall spending, 2011 looks as though it might be the year of recovery. Global data shows a definite improvement trend, but regional disparities show a more mixed picture.

In **2010**, the impact of the crisis was still quite visible, resulting in global spending holding steady, or even falling slightly: overall spending was at \$65 billion: down 0.3% overall, with a marked reduction in capital spending (down 6%). Maintenance spending, relatively stable in comparison with historic growth rates, grew by 5.3%. Spending on catalysts and chemical products held steady, increasing only slightly (by 0.1%), reflecting the slowdown in activity. The US - where capital spending fell by 11% - and Europe - where refining capacity continues to fall - have a significant impact on this overall data (the US accounts for nearly a fifth of worldwide capital spending); Asia (China in particular) has tempered this fall in spending: its refining capacity continues to increase, despite the world economic slowdown.

**Table 8: Refining industry global spending (in billions of \$)**

	2008	2009	2010	2011 (p)
Investment	23.5	25.4	23.9	25.1
Maintenance*	23.2	24.6	25.9	26.9
Catalysts and chemical products	15.0	15.0	15.0	15.9
Total	61.7	65.0	64.8	67.9

Source: IFP based on HPI Market Data; (p) projected  
 - 40% for facilities and equipment and 60% on labour and services.

In **2011**, predictions in relation to spending factor in an increase in the three budgets under consideration - capital, maintenance, catalysts and chemical products - coming to \$68 billion in total - an increase of 4.8% compared with the previous year. Capital spending increases by 5% - the equivalent of the delay incurred during the previous year, evidence of a clear recovery in activity. The maintenance budget increases less rapidly (3.9%) after many years hovering at an annual rate of around 5%. Spending on chemicals/catalysts, which is globally proportional to refinery processing, increases by 6%, also evidence of something of a recovery. In the wake of the events of summer 2011 and the sovereign debt crises that have been affecting the world's industrialised countries, these predictions may now seem optimistic, since the impact of this new economic situation has not yet been properly assessed: it may be that the trends described above will become more pronounced, pitting the refining sectors of the world's industrialised countries against some major difficulties. The planned readjustments run the risk of affecting growth and having an impact on the oil market: there may be another fall in demand for oil in these countries<sup>9</sup>.

Eventually, the various ways in which the world's emerging countries and its industrialised countries interact with one another may affect economies throughout the world. A downward

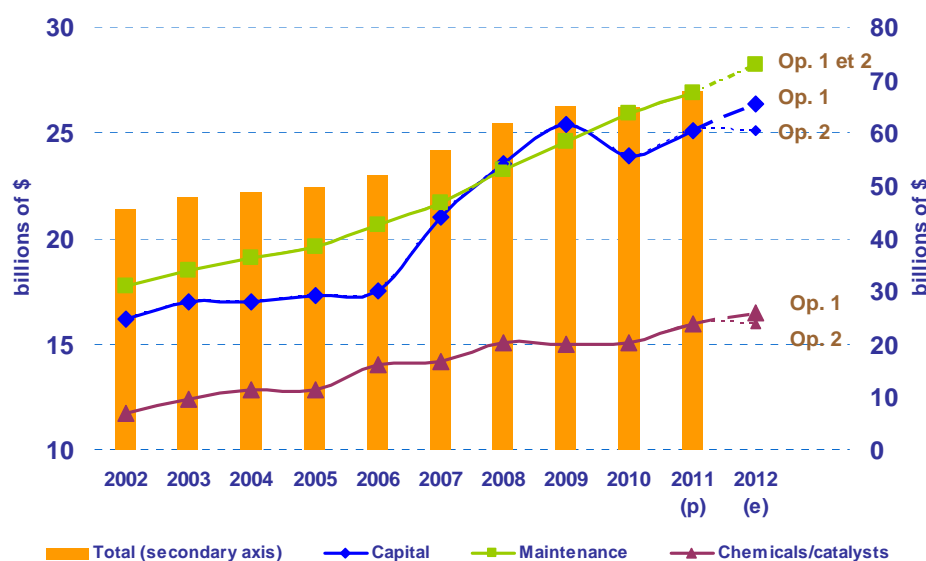
<sup>9</sup> "Based on existing relationships between growth and oil demand, we predict a fall in oil demand of approximately 0.6 mbd - 0.7% - for each percentage point of growth. This level of 0.6 mbd is far from negligible: this is the equivalent of approximately a third of Libya's potential that has vanished since the events of last February". Analysis published by IFP Énergies nouvelles, Oil markets and debt crisis, trends and issues.

adjustment of growth in the world's OECD countries could have an impact on the emerging countries that are currently driving world growth.

As far as **2012** is concerned, the current economic situation would suggest that considerable caution is required in terms of estimating spending. However, a significant amount of spending for 2012 has already been confirmed and cancelling all of it would be difficult to manage. There are two possible options: the first involves continuing with the development forecasts that were formulated before the crisis, and the second involves factoring in the economic slowdown.

- Not factoring in the new economic context (option 1), spending should continue to increase right across the board, while bolstering capital spending (5%), which includes the introduction of new capacity, which should speed up into 2012<sup>10</sup>; as far as spending on maintenance and chemicals/catalysts is concerned, an increase in line with recent rates can be expected (4.8% and 3.5% respectively since 2002). Maintenance spending would reach \$71 billion.
- If the new economic context is factored in (option 2), a slowdown relative to activity can be expected - particularly spending on capital and chemicals/catalysts, which will stagnate. Spending on maintenance should continue to grow - as it did during the previous crisis (2008/2009). In this second scenario, spending would reach \$69.5 billion - \$1.5 billion less.

**Figure 44: Change in refining industry global spending (in billions of \$)**



Source: IFP based on HPI Market Data; (p) projected, (e) estimated

The trends should not vary from region to region: growth across the board in all emerging countries, growth mainly in relation to upgrading/revamping projects in the US and stagnation in Europe - or even decline if the current trend of refineries being closed/modified/converted continues. Indeed, there is major uncertainty regarding the future of certain refineries in the OECD countries, where declining demand for oil seems to be a structural development (as a result of energy efficiency, competition from alternative energy sources, oil industry standards, etc.)

<sup>10</sup> According to KBC: Global Energy Perspectives – Oil refining: Asset sales signal the start of a new area for the Atlantic Basin (11/07/2011)

### Refineries that have been sold, are for sale, or which are likely to be completely overhauled or closed:

Since the crisis of 2008/2009, the drive to restructure the refining sector has picked up speed. Oil companies - integrated oil companies or just refiners - decided some time ago to divest themselves of their downstream assets and refineries, and in some cases, their distribution networks. This "disinvestment" has taken various forms - such as selling, modifying/converting or partly/completely closing industrial facilities<sup>11</sup>. Refineries that are for sale or have already been sold currently account for 3.1 mbd; those that have undergone dramatic overhauls account for 0.75 mbd; and those that have been either partly or completely closed represent 0.82 mbd - a grand total of 4.73 mbd.

Refineries are mainly being restructured in this way in industrialised countries - in Europe in particular. 54% of the assets being sold, restructured or closed in this way are in Europe. The rest are in North America and the Caribbean, accounting for more than a third of the total. More than two thirds of the refineries that are for sale or which have already been sold are in Europe. North America and the Caribbean countries are behind them, accounting for nearly 30% of the total. In terms of facilities that have been modified, there is a similar distribution. Most of the facilities that have been either partially or totally closed are in North America and the Caribbean - 60% of the world total. The Asia-Pacific region is just behind. This type of strategy is less popular in Europe.

Integrated companies, such as Chevron, total and Shell, justify this reallocation of their investments by looking for better profitability - which the upstream oil sector can afford them. But what is surprising is that companies which operate in the downstream oil sector - such as Petroplus, Valero and Sun Oil - are also getting rid of their refineries - despite a clear fall in sales prices. These trends show that manufacturers are fundamentally pessimistic about the long-term future of refining in the world's industrialised countries, leading them to invest elsewhere: the refining sector is most likely going to experience significant difficulties as a result of major investment in additional conversion capacity in particular in order to keep pace with the growing demand for middle distillates, current and future regulations, overcapacity and the prospect of very low refining margins. Choosing a given solution - selling, modifying or closing down a facility - is difficult. Converting a facility into an oil terminal is more financially advantageous overall than closing it down altogether, but from a political perspective, it is better to sell it than to shut it down. Finding a consensus solution goes beyond the purely financial framework.



## 3.5 Relaunching projects to build new capacity

A distinction should be made between two types of projects. **"Probable" projects** have a high likelihood of being carried out whereas **"possible" projects** tend to be announced for their effect and are less likely to materialise<sup>12</sup>. The change in the projects under way is measured in production capacity (kb/d).

### 3.5.1 Distillation capacity

- If only probable projects are considered, new distillation capacity worldwide would total 9.1 mbd in 2011, a 16% drop from the number of projects identified in 2010 (which had fallen

<sup>11</sup> Another type of restructuring may emerge over the next few years: in integrated companies, upstream and downstream activities may be separated - as is already the case with ConocoPhillips. We will have to wait a little longer to see if other companies widely adopt this strategy.

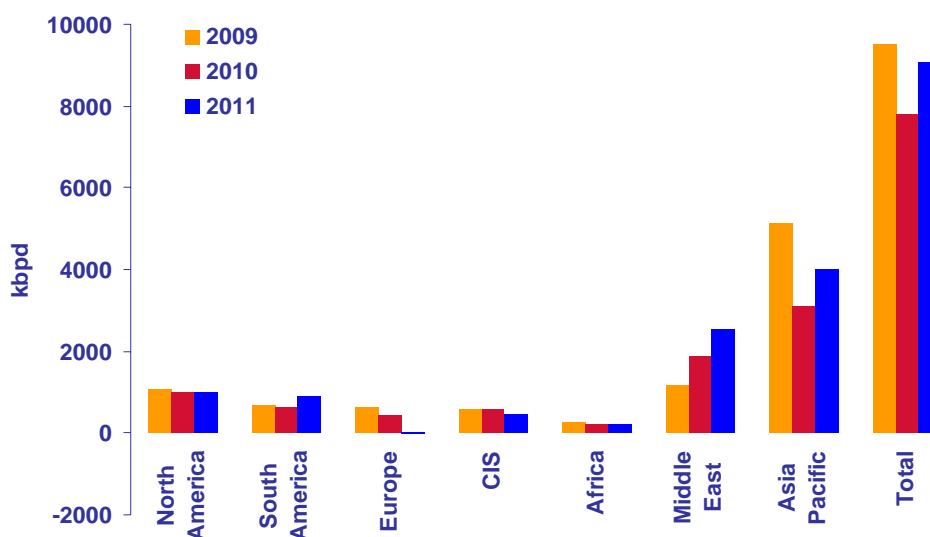
<sup>12</sup> This analysis involves projects that were identified in April 2011

dramatically as a result of the world economic crisis). 2011 shows a clear recovery in the numbers of projects under way.

However, the outlook varies dramatically from region to region. Asia, the Middle East and Latin America are all areas in which there is a great deal of activity: the numbers of projects are increasing significantly - 20%, 36% and 43%, respectively. The Middle East is the only region to have been spared the effects of the crisis. The other regions - Africa, North America, Europe and CIS - have all seen a fall in the numbers of projects for the second year running. Europe is the most affected - after a fall of 34% in 2010, it is seeing a fall in production capacity in terms of projects (there are more projects to close or shut down production than there are to develop new capacity).

The worldwide situation regarding distillation projects is significantly affected by trends in the Asia-Pacific region: China alone accounts for 32% of all projects to build new capacity throughout the world. Globally, mid-term prospects are still considerably healthier - despite the likelihood of a further decline in capacity in Europe.<sup>13</sup>

**Figure 45: Refining projects – distillation capacity by geographic region**



Source: IFP based on data from KBC

The main projects in expanding regions:

- IOC Paradip (Orissa), India 300 kb/d
- PetroChina/PDVSA (Jienyang), China 400 kb/d
- Sinopec Zhenhai Refinery, China 300 kb/d
- Sinochem KPC/Total (Quanzhou), China 240 kb/d
- CNOOC Huizhou, China 200 kb/d
- PetroChina (Chengdu), China 200 kb/d
- PetroChina (Yunnan), China 200 kb/d
- Saudi Aramco/Total Jubail-2, Saudi Arabia 400 kb/d
- Saudi Aramco Yanbu, Saudi Arabia 400 kb/d
- Saudi Aramco Jizan, Saudi Arabia 400 kb/d
- Takreer, Ruwais, Abu Dhabi 417 kb/d
- Petrobras Maranhao, Brazil 300 kb/d

<sup>13</sup> For example, a third refinery may well close in France, together with six others in Italy. This is according to Pasquale De Vita, chairman of the Unione Petrolifera. "We are running the risk of losing between 10 and 20 million tonnes of refining capacity", he says. "The smallest refineries are under threat - those that are not directly connected to the sea, those that are finding it hardest to invest in the necessary new technology (and enormous investments are needed)".

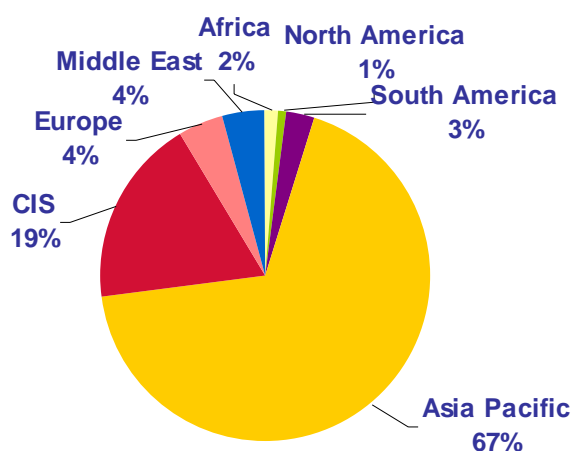
- Petrobras/PDVSA Pernambuco, Brazil 230 kb/d

The following are outside the world's fast-expanding regions:

- Motiva, Port Arthur, US 325 kb/d
- Pemex Tula, Mexico 250 kb/d
- Turcas / Socar, Aliaga, Turkey 200 kb/d

- The effects of the world economic crisis and uncertainty over the future are still foremost in the minds of industrial investors: more than 20% of the projects identified in 2011 have now been postponed to a later date - the equivalent of 1.9 mbd of new refining capacity; more than 90% of the capacity that has been postponed is concentrated in two regions: Asia-Pacific (67%) and CIS (19%). China accounts for more than 50% of the new capacity the construction of which has been postponed in this zone.

**Figure 46: Refining projects – distillation capacity that has been postponed by geographic region**

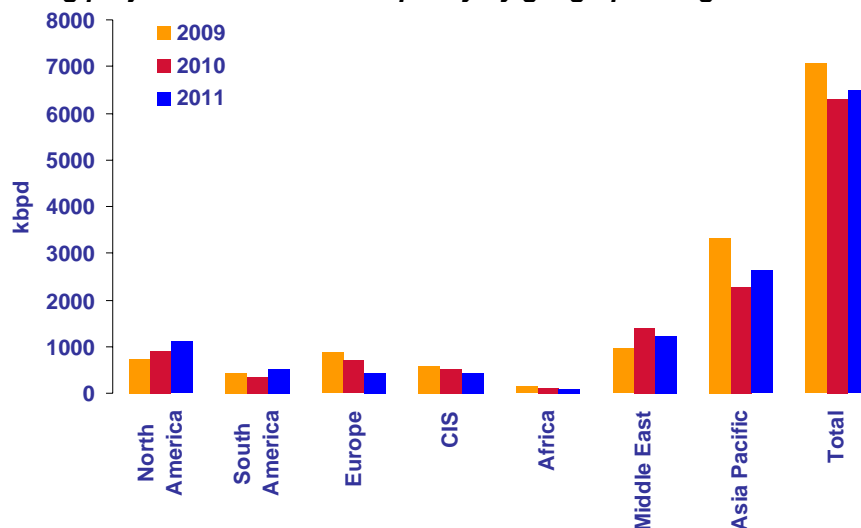


Source: IFP based on data from KBC

### 3.5.2 Conversion capacity

- If we consider "probable" projects only, new conversion capacity stands at 6.5 mbd in 2011, a moderate increase (3%) compared with the number of projects listed the previous year over the same period, and 16% up on the number of distillation projects forecast. Conversion projects are also experiencing difficulty in returning to their pre-crisis growth rate.

The Asia-Pacific region accounts for 15%, South America for 49% and North America for 22%. Unlike other regions across the world, the number of projects under way in North America has been increasing continuously since 2009. Efforts in this region have been focused on increasing conversion capacity, rather than on distillation capacity. Europe, the CIS, Africa and the Middle East have all seen fewer projects compared with 2011.

**Figure 47: Refining projects – conversion capacity by geographic region**

Source: IFP based on data from KBC

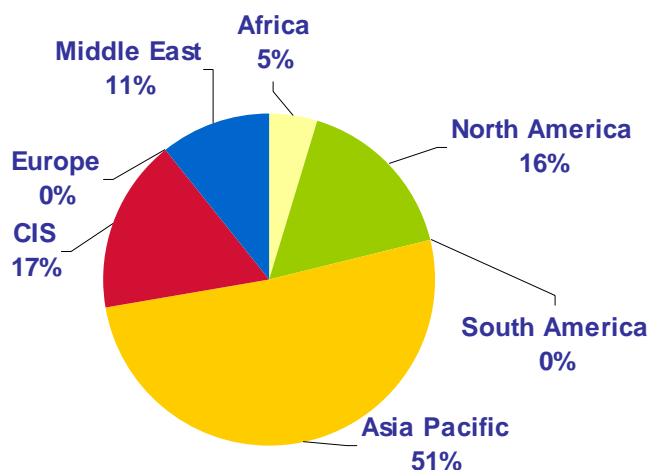
The main projects in expanding regions:

○ Pemex, Tula, Hidalgo, Mexico	Delayed coking	181 kb/d
○ Pemex, Tula, Hidalgo, Mexico	Delayed coking	181 kb/d
○ Pemex, Tula, Hidalgo, Mexico	FCC	110 kb/d
○ Petrobras, Maranhao, Brazil	Delayed coking	120 kb/d
○ Essar, Vadinar, India	Delayed coking	98 kb/d
○ PetroChina/PDVSA, Jieyang, China	Delayed coking	120 kb/d
○ PetroChina/PDVSA, Jieyang, China	Hydrocracking	120 kb/d
○ PetroVietnam/KPC/Mitsui/Idemitsu, Vietnam	RFCC	120 kb/d

The following are outside the world's fast-expanding regions:

○ Saudi Aramco/Total, Jubail 2, Saudi Arabia	FCC	120 kb/d
○ Saudi Aramco/Total, Yambu, Saudi Arabia	Hydrocracking	120 kb/d
○ Takreer, Ruwais, Abu Dhabi	RFCC	127 kb/d

- Conversion projects have also been postponed - and to a similar degree as distillation projects: nearly a quarter of all projects were postponed in 2011 (23%) - the equivalent of 1.5 mbd of conversion capacity. Because of the sheer number of projects identified in China, it accounts for more than half of all postponed projects - the equivalent of 0.8 mbd.

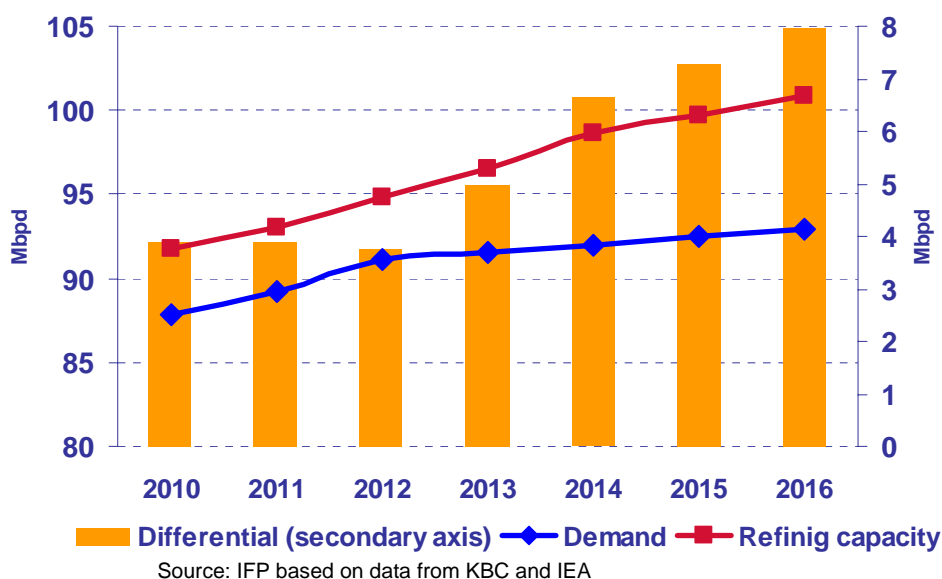
**Figure 48: Refining projects – postponed conversion capacity by geographic region**

Source: IFP based on data from KBC

### 3.5.3 Increased overcapacity in the medium-term

Globally, the medium-term outlook for demand and refining capacity shows that - after something of a tightening - the difference between the two values is widening, meaning that refining overcapacity will once again be pushed up starting in 2013. In view of additional capacity, medium-term operating capacity and projected oil demand according to the IEA<sup>14</sup>, which - given the uncertainty regarding the future - foresees a downward trend in world oil demand over the long term<sup>15</sup>, and the situation is likely to deteriorate between now and 2014 - and beyond that, pushing up overcapacity. According to forecasts, overcapacity looks set to continue to grow, worsening the imbalance in 2013 and 2016, which had been underestimated last year (2010 study). These trends will result in a weakening of the tension between supply and demand, and more specifically in a further easing of the pressure on refinery utilisation rates, following a weakening of refining margins.

**Figure 49: Medium-term trend in refining capacity and demand, 2010**



This growth in new capacity has obviously been sustained by the Asia-Pacific region. But it will also start to be driven by the Middle East from 2013/2014 - this region should see a number of major projects being finalised by then (Jubail-2 and Yanbu in Saudi Arabia and Takreer in Abu Dhabi) - and then to a lesser extent by Latin America (Petrobras Maranhao in Brazil).

With the exception of North America, all regions throughout the world are experiencing overcapacity to varying degrees: although demand and capacity in the Asia-Pacific region are more or less balanced, the CIS region has a refining capacity that is almost twice as great (in barrels per day) as its internal demand for oil products. And if the numbers of projects that have been announced are anything to go by, this situation looks set to continue. There are currently no plans to reduce capacity in this region.

In the OECD countries - particularly the OECD market in Europe - the differential between these two values is tending to widen slightly. This is because of two factors: demand is continuing to fall, while refining capacity - which after a period of decline brought on by a number of refineries closing between 2010 and 2012 - is now starting to rise again slightly. This is as a result of a new 200 mbd refinery having been brought into operation in Turkey (Turcas/Socar). In these regions, a new balance must still be established between refinery

<sup>14</sup> WEO 2010

<sup>15</sup> Average annual growth in oil demand of 0.6% between 2009 and 2035 under the "New Policies Scenario". In 2009, the WEO projections in the reference scenario included a 1% growth in demand between 2008 and 2030.

infrastructure and internal demand, so that the industry can respond to more stringent product quality specifications (primarily with regard to sulphur content), as well as to structural demand trends (reliance on diesel fuel in Europe, etc.).

In the world's emerging countries - China and India mainly - the situation is different: demand is strong and activity is still at a healthy level. Overcapacity is not excessive and is likely to keep pace with changes in demand.

So a phenomenon observed in recent years - whereby refinery projects involving distillation or conversion capacity are relocated to the most active emerging regions - has not changed, and should even pick up speed once the slowdown that is due to start affecting the economies of industrialised countries starts to take hold.

### 3.6 Investments, different stakes depending on region

Globally, new capacity will continue to be built. The rapid rate at which new assets are being brought into operation - combined with the slowdown in demand - will result in an increase in overcapacity in the medium-term. This in turn will reduce the utilisation rates of refining facilities, weakening margins. Significant investment will be needed in the near future in both industrialised and emerging countries. However, these investments will differ slightly depending on the group of countries in question.

Given the gloomy outlook for the years ahead, increasing numbers of European and American oil companies are ceasing their downstream activities. The drive to restructure refining and consolidate it around more profitable industrial facilities is now under way. Significant sums are expected to be invested<sup>16</sup>, and will have to overcome numerous constraints, such as the need to adapt refineries in terms of demand volume and end products<sup>17</sup>, taxes on hydrocarbons, the search for a different energy mix, more stringent norms and specifications for products and regulatory standards governing the operation of refineries<sup>18</sup>. Making these adjustments will be painful and will involve reducing refining capacity, while the profitability of costly hydrocracking units - which are required in order to keep pace with increased use of diesel engines in cars - remains uncertain. This is because of uncertainties over how long this situation will last in the mid-term (continuation of tax benefits, impact of the Euro 6 standards). The development of biofuels (RED directive) is also reducing demand in refineries.

It is very important to maintain a balance between investment (in terms of both capacity and complexity) and demand in emerging countries, while at the same time complying with environmental constraints. Investment in new distillation and conversion capacity that can both meet internal needs (which are subject to increasingly stringent environmental constraints) and external needs in order to ensure better positioning on export markets. Refineries in the Middle East are increasingly adapting their facilities to produce clean fuels. Examples are the major projects currently under way in Saudi Arabia and Abu Dhabi which are designed to produce large volumes of fuel with very low sulphur content. These products will compete with refineries in Europe which are having difficulties disposing of their petrol surplus. Similarly, new export refinery projects are under way in Brazil. Competition looks set to be very stiff in the Atlantic basin.

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<sup>16</sup> Depending on the various crude oil supply scenarios for Europe between 2005 and 2030, and factoring in the various policies that have been adopted and are now being applied by the EU, the investment required in order to bring European refining capacity up to the desired level is between 18 and €29 billion (depending on the various scenarios). Between €3.3 and €12 billion of this is earmarked for ensuring that the future specifications for marine fuels are complied with. "Oil refining and the supply of petroleum products in the EU" – Commission Working paper, Brussels.

<sup>17</sup> In order to meet growing demand for middle distillates, significant sums will need to be invested in additional conversion capacity.

<sup>18</sup> As far as greenhouse gas emissions - CO<sub>2</sub> in particular - it should be remembered that middle distillate production units consume significant quantities of energy, and so release more CO<sub>2</sub> than other units. Through Europe's emissions trading scheme, the refining sector will have to pay more for its CO<sub>2</sub> emissions generated by more complex facilities required to produce the products requested in the European Union.

As far as China is concerned, it is currently increasing its refining capacity in order to meet its own internal demand. This is not the same as India's strategy. India is using its investments to target export markets - in Asia, West Africa and Europe in particular. At the same time, other Asian countries (Indonesia, Malaysia, Vietnam) are investing in projects to meet their own internal demand in the mid-term. This is tending to shrink the markets for export refineries.

A slowdown in the numbers of new projects would be needed to ideal in order to create the conditions needed for improved profitability in this sector. But given the drive to increase capacity in the world's emerging countries, this is not likely to happen. In most cases, this new capacity is being built by public companies which are able to take advantage of specific economic conditions, working within the framework of centrally fixed prices, outside the laws of the market. As a strategic sector, the State guarantees the continuation of its operations<sup>19</sup>. In such conditions, the margin constraint is less of a factor. If current forecasts are to be believed, a slowdown in the number of new projects does not look likely - quite the opposite.

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<sup>19</sup> Despite this guarantee, some Chinese companies (not the smallest - PetroChina and Sinopec) are calling for an expansion of the changes that were introduced in the price-setting mechanism for products sold on the local market in order to better reflect current market realities that are more likely to help improve margins. Other things being equal, they would be tempted to give priority to their financial profitability, guaranteed by their internal cost structures, so as to be competitive on the free market.

**Examples of refineries that are being or have been sold and/or are likely to be completely overhauled or closed:**

▪ **Europe:**

- Chevron – Pembroke –UK (210 mbd), sold,
- ConocoPhillips – Wilhelmshaven –Ger. (260 mbd), for sale,
- Ineos – Grangemouth - (200 mbd), for sale,
- Ineos – Lavéra - (210 mbd), sold,
- Murphy Oil - Milford Haven - UK (130 mpd), for sale,
- Petroplus – Reichstett – Fr (85 mbd), modifications/conversions (storage depot),
- Petroplus – Teeside – UK (117 mbd), modifications/conversions (terminal),
- Shell – Gothenburg – Sweden (78 mbd), for sale,
- Shell – Stanlow – UK (233 mbd), sold,
- Shell – Hamburg – Ger. (110 mbd), modifications/conversions (terminal),
- Shell – Heide – Ger. (91 mbd), sold,
- Total – Lindsey – UK (221 mbd), for sale,
- Total – Dunkerque – Fr (137 mbd), modifications/conversion (terminal),
- Total – Gonfreville – Fr (94 mbd), closure (distillation unit)
- ENI – Ceske raf. – It (170 mbd), modifications/conversions
- ENI – Livorno – It (84 mbd), modifications/conversions
- LyondellBasell – Berre – Fr (105 mbd), mothballed prior to closure?

▪ **North America and the Caribbean:**

- Big West – Bakersfield –US (68 mbd), sold,
- Chevron – Kapolei –US, Hawaii (54 mbd), closure,
- Murphy Oil – Meraux, Louisiana (125 mbd) for sale,
- Murphy Oil - Superior, Wisconsin (35 mbd) for sale
- Shell – Montreal – Can (13 mbd), modifications/conversion (terminal),
- Sunoco – Eagle Point – US (150 mbd), modifications/conversion,
- Valero – Delaware – US (190 mbd), sold,
- Valero – Paulsboro – US (166 mbd), modifications/conversion,
- Valero – Corpus Christi – US (20 mbd), closure (FCC),
- Valero – Aruba – US (275 mbd), for sale,
- Western Bloomfield – US (17 mbd), closure.

▪ **Asia and the Pacific:**

- CPC Corp Kaohsiung – Taiwan (25 mbd), closure (FCC),
- JX Holdings Negishi – Japan (70 mbd), closure (distillation unit),
- JX Holdings Mizushima – Japan (110 mbd), closure (distillation unit),
- Nihonkai Oil Toyama – Japan (60 mbd), modification/conversion (terminal),
- Shell Parsden Pt – New Zealand (109 mbd), sold,
- Showa Shell Keihin – Japan (60 mbd), closure (distillation unit).

▪ **Africa:**

- Shell – several countries (approx. 150 mbd), modifications/conversions.