

The Journal

RICS Property World



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Miami Skyline

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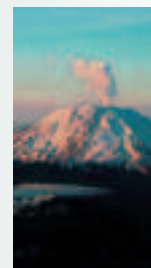
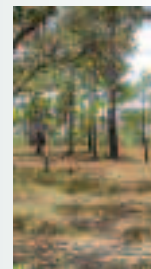
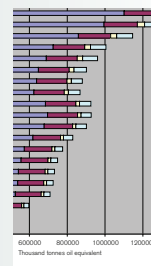
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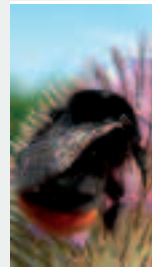
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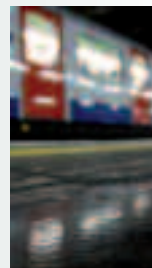
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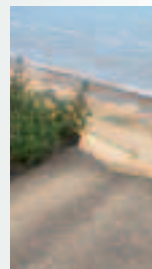
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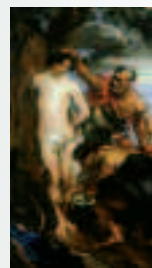


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The current pattern of urban development in Chinese cities is economically, environmentally & socially unsustainable

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The Serpent in the Garden

Marc Louargand FRICS



© Chad Anderson

Someone once observed that every decade the real estate industry invents a new vehicle for wealth transfer between the inventors and their investors. During my career we have seen this drama play out many times. New wrinkles in capital markets often lead to disheveled portfolios. In the mid 1970s, major banks seized upon the mortgage REIT as a vehicle to make loans that weren't presentable on their own books. What began as high leverage loans ultimately became construction financing, swing loans, bridge loans and gap loans, all semantic clothing for what were poorly underwritten risks. The ultimate denouement always comes, and in that era it came in the form of rapidly rising short interest rates (does that ring a bell?). The bank-sponsored mortgage REITs of the day had borrowed short to lend long. Bankers who forget the first principle – keep a balanced book – nearly always have a bad experience.

What causes smart and savvy players in our capital markets to make these kinds of errors? Is it the introduction of Moral Hazard via the presence of government intervention and backstopping? Is it hubris as suggested in the 1980s by Tom Wolfe's characterization of Wall Street's 'Masters of the Universe' which has an analog in today's concept of "the smartest guy in the room"? Or is it plain old Gordon Gekko greed? One comforting thought is that real estate is not

the only arena where this kind of behavior rears its head, even though it seems to happen in our backyard with some frequency.

In the early 1980s, we had the beginnings of the Savings and Loan (S&L) debacle which arose in the southwest and ultimately swept the country. Deregulation of banking and the thrift industry allowed S&Ls to enter the commercial lending market with a minimal level of oversight. The ultimate resolution of that experiment was the Resolution Trust Corporation which bailed out a \$30 bn lesson in the workings of Moral Hazard. With deposits guaranteed by the FSLIC (no longer with us), S&L lenders had few constraints on their portfolio lending activities since the government would make them whole in the worst case. When introducing Moral Hazard, one should expect the worst case to occur, since it usually shows up after a while. As a Federal Reserve White Paper put it in retrospect in 1992, "As the recent record of deposit insurance at banks and S&Ls illustrates, stronger guarantees can easily lead to excessive risk taking."

In the latter part of the 1980s, life insurance companies stepped in to fill the void left by failed S&Ls and chastised banks. Life companies paired their commercial mortgage origination business with single premium deferred annuities (SPDAs) and Guaranteed Investment Contracts (GICs) and became lenders of choice for developers. »

» One of the new wrinkles that emerged at this time was the merging of the traditional roles of banks and insurance companies. Banks had heretofore been construction lenders, taking on the risk of the business of building, while insurers had issued permanent financing when projects were completed, thus taking on the real estate risk but not construction risk. The emergence of the GIC business and parallel changes in banking gave rise to the 'mini-perm,' a combination construction and permanent loan with a shorter term, anywhere from three to ten years. Over time, these also came to be called 'bullet loans,' perhaps because of their effect on the developer when they came due in a weak market. Individual investors' SPDAs and pension investors' GICS were a major funding source for developers at a time when abrupt fiscal policy changes wreaked havoc on real estate markets.

Most economists would expect that housing would receive capital flows at the end of a cycle and be the flywheel that would restart the cycle

The Economic Recovery and Tax Act (ERTA) of 1981 bestowed bountiful changes in depreciation and amortization rules on the real estate industry, kicking off a spate of development activity that corresponded with an economic expansion. But the real estate deals were increasingly tax-driven rather than economics-driven. In 1986, the Tax Reform Act (TRA) took it all away and made real estate investment much less attractive from a tax standpoint. With a massive oversupply in the pipeline, developers continued to deliver new buildings at a time when the economy entered a slowdown and a recession. Defaulted mortgages, workouts and bank and insurance company downgrades and failures followed. Another vehicle had worked its magic on the capital markets. In 1991 alone, Executive Life, First Capital Life, Fidelity Bankers Life, and Mutual Benefit Life failed. Their portfolios were heavily biased toward mortgages and junk bonds, the other "innovation" of the 1980s capital markets.

At least real estate has had company along the way. In the mid-1980s, a concept called 'portfolio insurance' (the ancestral progenitor of quant trading and the hedge fund sector), attracted substantial interest until it failed to deliver in the market crash of 1987. The early years of hedge fund growth included the spectacular failure of Long Term Capital Management in 1998, whose

Nobelist-laden management made massive bets on interest rate spreads that went brutally against them. Moral hazard played a perhaps unanticipated role when the Treasury and Federal Reserve intervened to ease the pain. The concept of 'too big to fail' was the justification for their actions.

Following a period of expansion in the 1990s, the U.S. economy went into recession in 2001, followed by a robust expansion that has continued to date. Early in the current cycle, monetary and fiscal policy encouraged investment in housing. Most economists would expect that housing would receive capital flows at the end of a cycle and be the flywheel that would restart the cycle. This has been housing's role for many decades. But this time we had a confluence of events that created a perfect storm. Policies that encouraged housing investment, demographics that swelled the ranks of likely homeowners and a reluctance to embrace the stock market after the tech crash of 2000 all combined to ignite a housing boom that could only be sustained by the introduction of another new instrument, the Collateralized Debt Obligation or CDO. The mortgage market has had a rich buffet of securitized instruments for many years.

Real Estate Mortgage Investment Conduits (REMICS) – typically residential – Collateralized Mortgage Obligations (CMOs) – typically commercial real estate – as well as derivatives built from these basic forms. One such derivative offered the ability to magically transform what was known as 'toxic waste' into highly rated paper, the CDO. The toxic waste was, of course, the various types of home loans known as 'sub-prime.' What made a loan sub-prime? There were some fairly innocent ways to earn the designation. Sub-prime had a near neighbor in the 'Alt-A' category. These were loans that appeared to be less risky but still didn't fit into traditional models. They were too big ('Jumbos') or lacked a full set of documentation ('No-Docs') or had high loan-to-value ratios. But the elephant in the room is the pool of sub-prime mortgages that were:

- made to borrowers who would not have qualified for a mortgage a decade ago
- made to borrowers who borrowed their down payment
- made to speculative buyers who had existing residential mortgage debt supportable only by the continuation of a housing boom.

In 2001, according to Fitch Ratings and Derivative Fitch, 41% of the average CDO portfolio consisted of Real Estate Mortgage-Backed Securities (RMBS) paper. By 2005 that had doubled to 82% of new CDO issues. Thus, the portfolio risk of CDOs was increased substantially by abandoning a prudent diversification strategy to rely on mortgage paper.

But the risk was compounded by the growth of sub-prime tranches in RMBS issues until sub-prime RMBS tranches came to dominate the portfolio of CDOs. According to Standard & Poor's, the 2006 vintage CDOs that it rated averaged 70% sub-prime RMBS collateral. If the average was 70% we can assume that some were even higher.

Rating agencies have been the critical element in the proliferation of derivative securities. If institutional investors can buy a piece (a tranche) of a derivative instrument that a board member or trustee might not understand but can point to a rating of AAA or anything above BB, then they have apparently met their fiduciary duty. But the content of the instruments changed dramatically over the past decade without any apparent shift in the relative ratings of each tranche or the share of the total offering that was highly rated.

It was a classic example of capital market magic, supported by a booming housing market and declining interest rates. Rating agencies apparently used models that estimated default rates under rosy conditions, not those that might obtain if rates rose while prices flattened or declined. Today, we have a problem of valuation in these instruments. The problem is that no-one who holds them wants them to be valued by reference to market transactions rather than by reference to a pricing model. 'Marking to model' may be the most significant weakness of the entire episode. Marking to market will seriously impair their perceived value.

Ratings are about the estimation and underwriting of risk. One Wall Street veteran recently observed, "When I was first on the Street, people talked about risk-adjusted rate of return, now it's risk-ignored rate of return, and that always has sad ends." That remark seems prescient when considering the miracle of transformation that turned a pool of junk-rated paper into a tiered pool of investment grade paper with only a minor toxic residual. It brings to mind the medieval alchemists and their search for the 'philosopher's stone'. Who knew it was in lower Manhattan all along, waiting to turn dross into gold?

Why have investors taken on so much risk? The simple answer is that long-run allocation models are built on the returns of the past twenty, thirty or forty years – a time when annual returns were generally high. But forward-looking estimates are far less generous and the mainstream thinkers tend to see mid-to-high single digit returns in the equity and debt markets for some time to come.



As a result, investors have moved heavily into alternative investments including real estate, derivatives, commodities and private equity of all stripes. According to Lipper, alternative funds (typically defined as real estate, venture capital, buyout and hedge funds and commodities) have grown by 600% since 2002.

Long-short funds, known as 120/20 or 130/30 funds are a popular flavor today. Their concept is simple, invest 120% or 130% of capital in long positions and fund the overinvestment by taking on 20% to 30% in short positions. The only flaw in this model is that the long positions must go up and the short positions must go down or else it does not work.

Hedge funds have grown dramatically in the past decade despite the fallout from Long Term Capital Management in the mid-1990s and Amaranth's recent multi-billion loss. The source of the Amaranth loss was a classic example of someone making a huge bet on the direction of a single commodity price. In this case it was natural gas, but didn't the Hunt brothers teach us that lesson in the silver markets back in 1980?

The most recent entries into the alternative investment arena are the infrastructure funds that buy or lease public assets and privatize them. One major issuer of such funds has recently acquired a 99 year lease on a major urban highway, the Chicago Skyway. The terms of the deal are such that the heavily levered fund is also borrowing the annual leasehold payments since current earnings don't approach them. How will this play out when the effective payout requirement climbs precipitously in years to come? According to a Morgan Stanley analyst, the Skyway deal calls for initial year interest payments of \$129,000 to allow for needed capital improvements, but the

\$961m debt contract calls for escalating payments, rising to \$480m in 2018. How will the operator service a rapidly growing debt service burden? The parallels to the current Sub-prime and Adjustable Rate Mortgage issues are striking. Will the infrastructure deals meet the same fate as the Leveraged Buyout transactions (LBOs) in the recent credit squeeze? Short term bridge loans by banks to the LBO funds were to be taken out by refinancings in a low rate easy credit environment. After spreads widened and availability tightened, these bank loans became 'hanging bridges' suspended in a tight credit market with no apparent connection to the Promised Land.

So, is it moral hazard, hubris or a reliance on a government willing to step in when it is not obligated to do so? Today in 2008 we are engaged in a public discussion over the legitimacy of intervention to aid individual homeowners who are caught in the credit squeeze. Perhaps we need to broaden that debate to include those who are 'too big to fail' as well as the homeowner down the block. Perhaps the discussion should address the introduction of moral hazard at all levels of the capital market. While we're at it, perhaps we should take a long, hard look at the role and behavior of rating agencies as well. It will be enlightening and entertaining to follow the debate. There is one certain outcome that can be predicted today. At some point in the future, in some room, the 'smartest' person there will come up with an idea that will start the whole process over again. Count on it.

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East meets West

Nicholas Brooke FRICS looks at the impact of the US/Europe credit crunch on the Asia Pacific commercial property market

At the time of writing, the announced quantum of write downs due to sub-prime issues amounts to some US\$120bn worldwide. It would appear that this is by no means the end of the story with predictions that the total relating to sub-prime alone could be in excess of US\$250bn. If consequent credit card and other related potential losses are taken into account, the total could be over US\$400bn. Even US\$120bn is a shock to the system and if we are looking at a figure some three times or more greater than this by the year end, then clearly there has to be some impact on property markets globally. However, while US and UK are being affected by credit restrictions, the impact in Asia to date has been muted and it is largely seen as a US/European challenge.

The reality, of course, is that Asia is not totally immune to what happens elsewhere in the world, particularly those economies such as Hong Kong and Singapore which function very much on a global basis, and there is a growing realization that Asia does not operate in a vacuum and that, at this time, the external environment is best described as most uncertain and volatile.

Forecasts pre-potential sub-prime impact

Fortunately the majority, if not all, of the economies in Asia are in relatively good health. China leads the way with 2008 GDP growth, excluding impact from the credit crunch, anticipated in excess of 10%, with Vietnam not far behind and average GDP growth across the region (ex-Japan) forecast to be above 7%.

In practice, much of this growth is now generated through domestic consumption and intra-regional trade. As a result, the regional economies are to a large extent cushioned against any knock-on effect from downturns in the US and Europe. Even the most pessimistic of commentators are only envisaging a 1-2% reduction in average regional (ex-Japan) GDP, which is considered to be manageable.

Prior to the credit crisis, the challenges to the property sector in Asia centred around excess liquidity, insufficient quality product, unsustainable capital values (some people's viewpoint) and compression of yields. None of these issues has gone away and whereas it is likely to become increasingly difficult to raise debt, and even where credit is available it is being repriced, there are still significant amounts of capital wishing to find a home in the property sector. This reflects increased fund allocations to real estate as an asset class and, in particular, to real estate in Asia. Granted, we may see some easing in yields if the equity content of transactions has to be increased and purchasers may become slightly more circumspect about marginal deals following a much needed, objective reassessment of risk, but it is possible that the pressure to invest in the region will continue. In any event even if, as may be the case, overseas investors are constrained by the need to make provisions for investment losses, there are plenty of Asian investors to take their place, let alone the flows now emanating from the Middle East.

The only exception could be mainland China where the authorities have tightened up significantly on local lending to real estate projects and made it very difficult for foreign investors to fund their transactions other than by injections of equity. As a result, the market is likely to slow and the development process will take longer but the blame cannot, in all fairness, be laid at the door of the sub-prime debacle. »

Strong and Consistent Growth

GDP Growth	2007	2008(f)
China	11.5	10.4
Japan	1.8	2.0
Vietnam	8.5	9.0
Singapore	8.5	6.5
Hong Kong	6.4	6.0
Malaysia	6.3	5.7
Philippines	7.2	7.2
Thailand	4.8	5.3
Taiwan	5.5	4.8
South Korea	4.8	5.3
Indonesia	6.4	7.0

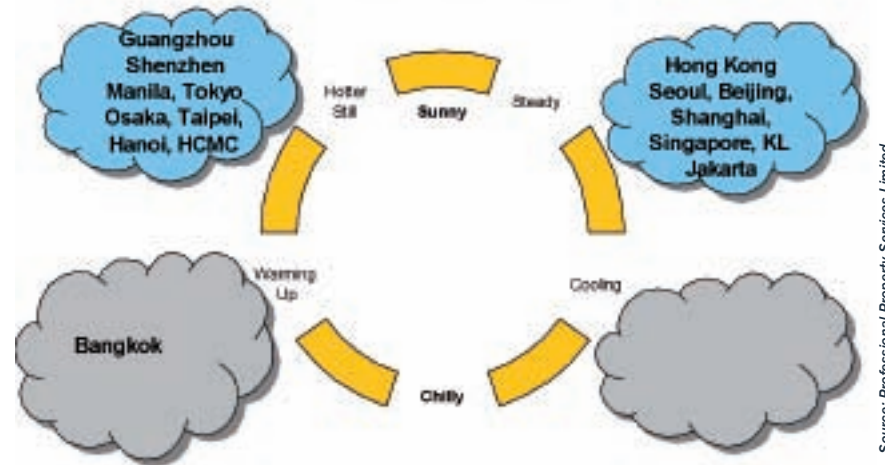
Rather, a government which has failed to recognise that the root of the problem is one of supply and taxing demand or that blaming the foreign investor is not the solution.

The other challenge that will remain is that related to project delivery and the shortage of senior professional talent in that again, while some projects may be delayed because of funding difficulties, the major constraint to delivery will be limited project management skills. This is a particular concern at a time when inflation is impacting significantly on construction costs and when the need for community engagement is extending the planning and development period.

Taking the office sector as the performance barometer, increased flows of external capital have spurred the growth of financial and professional services in many major Asian cities. However, while most markets are considered to be at or close to the top of their growth cycles, significant supply will become available over the next two/three years in a number of cities. In particular, Hong Kong and Singapore are expected to see an easing of rents, especially in decentralised locations, with a similar but slightly delayed pattern being repeated in Beijing and Shanghai.

By contrast, further strong growth is anticipated in Ho Chi Minh City and Hanoi where vacancies are at cyclical lows and to a lesser degree in Taipei and Bangkok where growth has been somewhat constrained by political uncertainties.

Office Rental Market Trends



Source: Professional Property Services Limited

Therefore, it is anticipated – seeing as economic fundamentals are far more robust than when Asia was previously challenged in 1997 – that the Asia-Pacific economies and real estate markets will weather whatever ill winds blow its way. The Asia story remains a very positive one and the challenges faced reflect the differing expectations of the newly arrived institutional investors as compared with the capacities of the region’s emerging markets. It is a steep learning curve for all, but well within the innovative and responsive capabilities of Asian entrepreneurs and their investment counterparts.

This article was previously published in the April/May 08 issue of the RICS Commercial Property Journal

Nicholas Brooke FRICS

Fragile colossus

New research from RICS explores the role of the property market in the economic and social development of China and identifies some troubling weaknesses in the system of the waking giant

China has been transformed over the last two decades into a major world economy. However, the extraordinary pace of development has been geographically unequal, both between urban and rural areas and between regions. The disposable income of the country's 562m urban residents is more than three times greater than that of the 754m rural residents, and growth on the east coast is far faster than in the western parts of China.

A new report, *Why China? Why Now?*, carried out on behalf of RICS and the leading Chinese property development company Shui On Land by Oxford Brookes University, explores the degree to which China's property market is ready to take its place on the world stage, and to play its role in supporting the country's economic and social development. The research method was in-depth interviews with key players in the Chinese market. On the basis of the findings, the researchers make recommendations for how the market should develop if it is to conform to the principles of sustainable urban development.

The current pattern of urban development in Chinese cities is economically, environmentally and socially unsustainable

On the way up

What status has property achieved in China's growing economy? Has the property market assumed the importance that it has in other developed economies around the world, where property is an asset class alongside equities and gilts and is integrated into the economy?

It is headed that way. The importance of property as a factor of production was recognized when China started to reform its command economy from 1979 onwards. In 1990, a land tenure system was introduced, as the property market began to replace the non-market allocation system that had been in place before and been very inefficient in terms of land use.

Now that it is the dominant means of land and property allocation, the property market is a major

driver of growth. Over the last 18 years, market-oriented property development has grown by an average of 29.1% a year, and it was responsible for 57% of all building activity in urban areas in 2004. A huge amount of new space has been made available to businesses by the development industry – one of the engines of economic growth and urbanisation in China.

Nevertheless, the property sector has some serious problems. Property development has been a major cause of the country's environmental and ecological problems and has fuelled financial instability and social tension, all of which impact negatively on the economic sustainability of the country.

Property has not been fully recognized as an investment asset by policymakers, who are yet to fully realise the potential of the market. The Chinese government has made great efforts to develop the stock market, which has generated significant funds for domestic companies and infrastructure projects, but the property investment market has largely been ignored at policy level.

If left unresolved, these problems could hold back the economic competitiveness of China and hamper the country's economic, social and environmental sustainability. As a result, both the government and the property industry are searching for solutions.

The property-led development model

The remarkable urban growth in Chinese cities relies on the property-led urban economic development model, which enables local governments to sell land-use rights (LUR) on state-owned land. Inevitably, this has brought problems:

- unrealistically ambitious development plans designed to generate increases in land values
- city-scale property speculation, with all its inherent financial risk
- lack of city-level, or even district-level, co-ordination of development
- continuous selling of, and building on, greenfield sites
- under-supply of land for non-market-oriented uses, particularly affordable housing.

This report contends that the current pattern of urban development in Chinese cities is economically, environmentally and socially unsustainable. Local



© Xin Zhu

The Beijing skyline hints at the scale of the colossus that is the Chinese property market

governments should embrace sustainable development, which is only possible under a plan-led development model, at a time when funds for financially viable projects are plentiful.

Being a pillar industry, property has increasingly dictated the pattern and scale of urban development, causing poor co-ordination between projects and infrastructure and between the projects themselves. The industry should change its function to serving, rather than leading, urban and economic growth.

Regulatory weaknesses

Although the legitimacy of private property rights has been recognized by the constitution, there is a lack of clarity on the protection of property rights. The Property Rights Law (PRL) was passed recently by the National People's Congress following more than a decade of deliberation.

The law aims to cover property rights in all major economic transactions and is not fully dedicated to the land and property sector. Being so comprehensive, the PRL fails to cover more detailed issues associated with the protection of land and property rights and does not address the problem of weak legal guidance and inadequate protection by existing ordinances and regulations.

Distorted housing supply system

In 1998, the central government set out a policy to create a housing provision system with low-rent housing (LRH) for the poor and 'economic, decent' housing (EDH) for the low-to-medium income earners to buy.

However, the policy was not strictly followed, and local governments prioritised market housing at the expense of EDH and LRH. The ratio of EDH investment to market housing investment peaked in 1999 at 16.6% and gradually fell to 5.2% in 2005. Some cities have no EDH supply at all.

The report concludes that the current housing provision system does not take into account the resource constraints in the country. A new regime of housing supply should be established to allow the market to allocate resources and to provide housing to those unable to afford market prices.

Immature commercial market

The commercial property market has exhibited a high degree of volatility, which has its origins in supply-side excesses, tending to produce waves of massive oversupply.

There are three causes of this oversupply. First, there is a lack of policy and planning guidance for the development of commercial property. Second, the property-led development model means that it is often necessary to sell sites in large numbers in a short period to raise funds for major infrastructure projects, such as the mass transit railway (MTR) system. Third, the officials lack experience. These factors have combined to create even greater levels of oversupply and failure in less-developed areas.

Improper supply and volatility in the commercial property market wastes land and financial resources, and the lack of a mature investment market limits opportunities for cities to respond appropriately to the needs of businesses and investors. Changes should be made to reform the development and management of, and investment in, commercial property, to enhance the competitiveness of cities.

The report puts forward these recommendations in the hope that they will be acted upon, to facilitate the continued development of the property market in China. RICS believes strongly that property markets that operate efficiently deliver benefits to society and the economy, through the effective allocation of resources, the provision of the proper support for commerce and economic activity, and the maintenance of a stable and harmonious society.

The industry should change its function to serving, rather than leading, urban and economic growth

This article was previously published in the February/March 2008 issue of the RICS Land Journal

Report by Amy Roberts, research officer at RICS aroberts@rics.org



The full report is available to download from www.rics.org/research

China's energy consumption

There's room for improvement in energy utilization efficiency, and the use of renewable and clean energy resources to solve environment problems and reduce greenhouse gas emissions

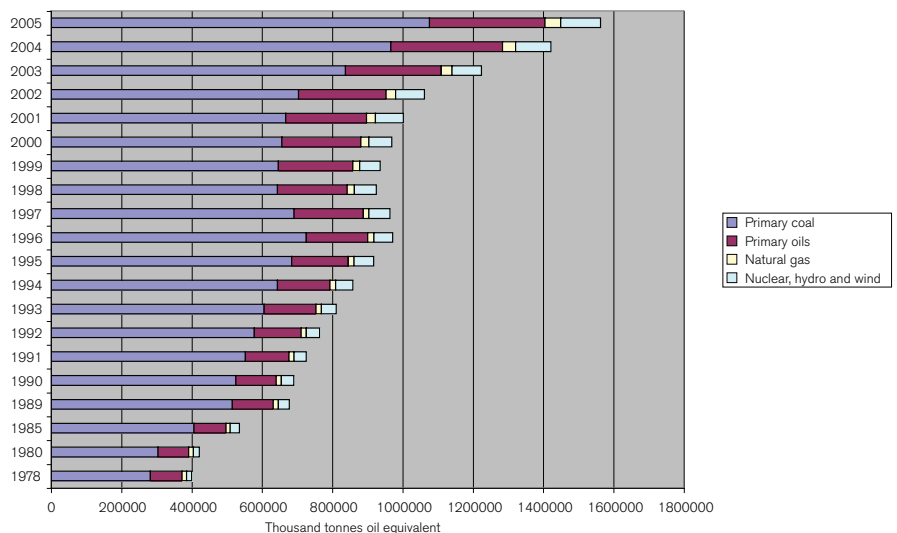


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The recent energy fact sheet detailing China's energy consumption released by RICS reveals that despite being the world's third largest energy producer (behind the USA and Russia), accounting for about 10.6% of the world's annual total energy production, China is also the second-largest energy consumer (behind the US), accounting for about 10.8% of the world's total annual energy consumption. Alongside this, demand has been increasing rapidly and is expected to grow at about 5% per year until the year 2020. One result of this large growth in demand is due to the energy consumption in China greatly outstripping domestic production capabilities.

According to the energy fact sheet, China's total primary energy consumption in 2005 was 1,560m tones oil equivalent (mtoe), a significant increase of 9.9% on the previous year. Energy consumption in China has also risen at a rapid rate, increasing by 291% since 1978. China is the world's largest consumer of coal, accounting for more than 28% of the world's total annual coal consumption, and it represents some 69% of Chinese total primary energy consumption. It is responsible for fueling 70-80% of power generation, 75% of energy used in industry, and 80% of household energy requirements.

China's energy consumption almost trebles since 1978; resulting as a net oil importer



China's total primary energy consumption

How is energy used in China?

Industrial energy consumption represents the largest element of total consumption at 71%, which is higher than in other developed countries. Overall, energy consumption in all sectors keeps rising.

CO₂ emissions in China

China is the world's second largest producer of carbon dioxide. However, with the world's largest population, carbon dioxide emissions in China are 3.88 tonnes per person, which remains below the global average level. However, China's industrial sector alone emitted 485 million metric tons of carbon in 1990, or about 75% of the country's total carbon emissions in that year. To put that in perspective, China's industrial carbon emissions are greater than the total emissions from any country in the world except the USA and Russia.

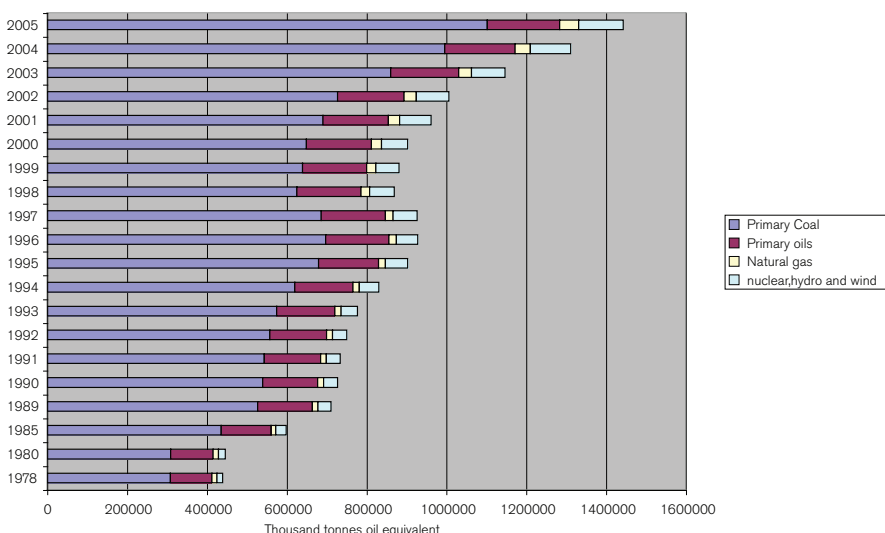
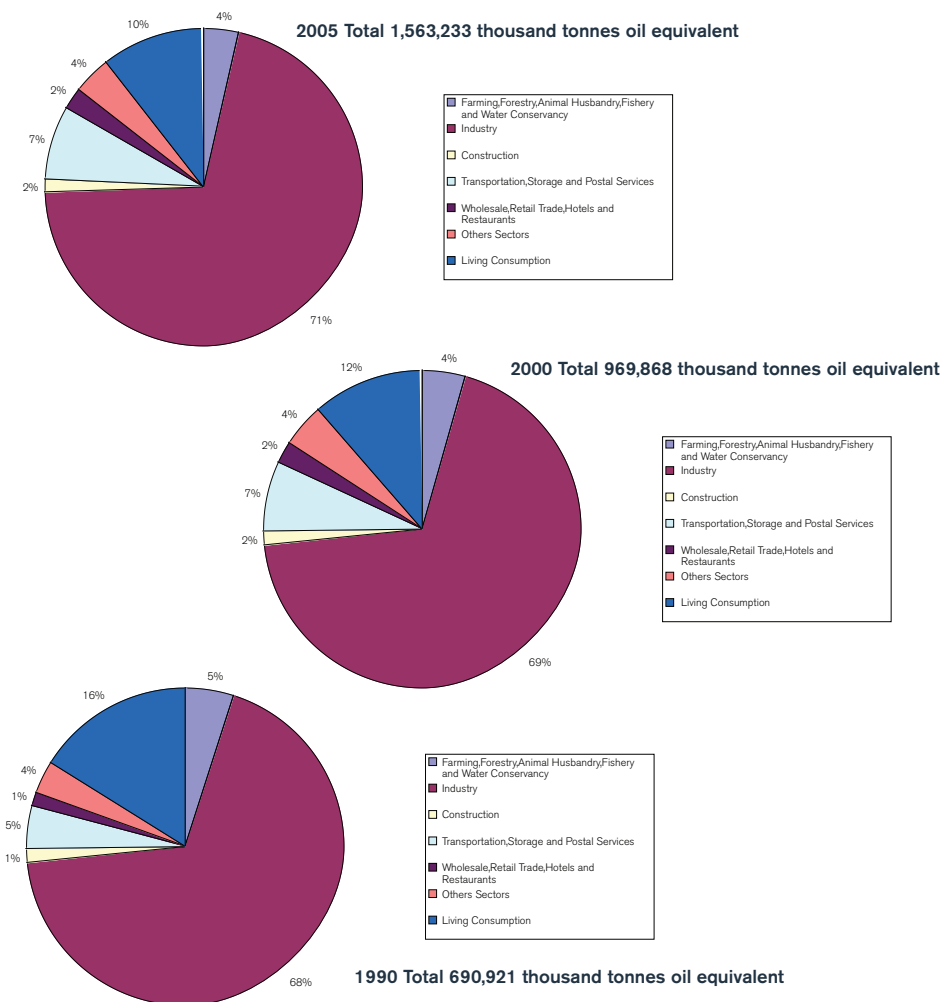
How is energy use being controlled in China?

A key issue is that energy consumption is rising rapidly in the industrial sector, at about 20.6% per annum, with consumption rising particularly rapidly in the heavy industry sectors, such as steel, construction materials, oil refining, and chemicals.

The Chinese central government has now realized that achieving its energy saving target is highly problematic and is now under heavy pressure to cut energy consumption. In response to this, the Government is now developing a draft amendment to the law on conserving energy, which details measures to avoid energy waste in different sectors to improve energy efficiency and cut pollution emissions.

Mr. Henry Li, Chairman of RICS China, said: "The issue of snow storms brought on by climate change in China in January and February 2008 is serious. Climate change is a more urgent problem. Taking care of our environment should be the top priority. By depicting the picture of the current energy usage in China, we hope this fact sheet will help the government to set a strategic plan and regulation to improve the environmental issue."

Mr. Li added: "Facing the threat of global warming, the central government of PRC has already taken some proactive initiatives to improve the environment. However, more is needed in order to reduce the consumption of energy level as a whole and minimize the carbon dioxide emission, particularly in the industrial sector. We believe this fact sheet will be a stepping stone for China to take a lead role in becoming a "green" country and further enhance it to achieve its societal and economic development goals.



China's total primary energy production

For more information: The China's energy fact sheet along with the Australia, New Zealand, Norway, Portugal, Spain, Sweden and UK fact sheets are available free as a PDF from the RICS website at: http://www.rics.org/Newsroom/Researchandreports/Researcharchive/energyfactsheets_r_130208.htm

Surveying the savanna

RICS-sponsored research in Belize shows that even the latest radar remote sensing techniques underestimate the carbon storage capacity of tropical savanna woodland

Over recent years, growing awareness of the effects of global warming has led to efforts to identify and preserve natural stores of carbon around the world. People commonly think of the Amazon and African rainforests as the major terrestrial stores of carbon, whereas savanna is commonly perceived as open grassland with minimal vegetation and therefore little scope for carbon storage. In fact, tropical savanna is the third-largest store of carbon in the biosphere, after the tropical and boreal forests. This is easier to understand when you consider that savanna is actually the most common land-cover type in the tropics and subtropics, covering between 10 and 30% of the global land surface (depending on which definition is used) and supporting more than 20% of the world's population.

Land managers are increasingly trying to account for the extent of savanna and tropical forests within their ownership since, under agreements such as the Kyoto Protocol, developing nations may be able to receive income from developed countries for maintaining and conserving forested areas as natural sinks for carbon dioxide and other greenhouse gases.

To calculate the amount of carbon stored in an area, you need to know the height and type of vegetation involved. However, measuring vegetation height by ground survey is a slow, labour-intensive process, impractical over wide areas and often not available as an option in developing countries.

Location... Rio Bravo Conservation and Management Area, northwest Belize, Central America

Research team... Duncan Moss, Neil Stuart, Karin Viergever, Ed Wallington and Iain Woodhouse of Edinburgh Earth Observatory, University of Edinburgh

Objective... to test whether synthetic aperture radar (SAR) data can be used as a means of assessing the amount of carbon stored in tropical savanna woodlands

Technique... a radar remote-sensing technique known as SAR Interferometry (InSAR), was used for estimating tree height in low-density woodlands

Studies in plantation forests at high latitudes have shown that the height of the tree canopy can be estimated quite accurately by radar remote sensing, but this technique has not been tested in more open woodlands, such as those in the extensive savanna regions of the tropics. Working out how much carbon is stored in savanna is more difficult because of the woodlands' widespread distribution, mixed composition and variable density of tree cover. Nevertheless, if the



A lower-lying, seasonally inundated area of 'savanna orchard', dominated by sedges, grasses and calabash trees



The main survey area showing the semi-continuous tree canopy provided by Caribbean pines and the grass understory typical of savanna

If accurate, the technique would offer the possibility of a continuous, non-destructive and relatively inexpensive method of measuring the carbon captured in vegetation over wide areas

technique could produce accurate estimates, it would offer the possibility of a continuous, non-destructive and relatively inexpensive method of measuring the carbon captured in vegetation over wide areas. This would be invaluable for both resource-management activities and the calculation of global carbon budgets.

Since the height of a tree is one indicator of the amount of carbon it stores, the aim of the research team was to find an area where radar remote-sensing data had already been collected, carry out a detailed field survey of the vegetation in the same area, and then compare the two sets of measurements of tree heights.

Such an area was in a savanna region of northern Belize where airborne radar data had previously been captured. The team undertook a precise topographic survey to establish the position and height of all the tree and shrub vegetation within a transect approximately 800m long and 60m wide. The accuracy of the vegetation heights estimated from the radar data were then evaluated against height estimates from the ground validation survey.

Ins and outs of InSAR

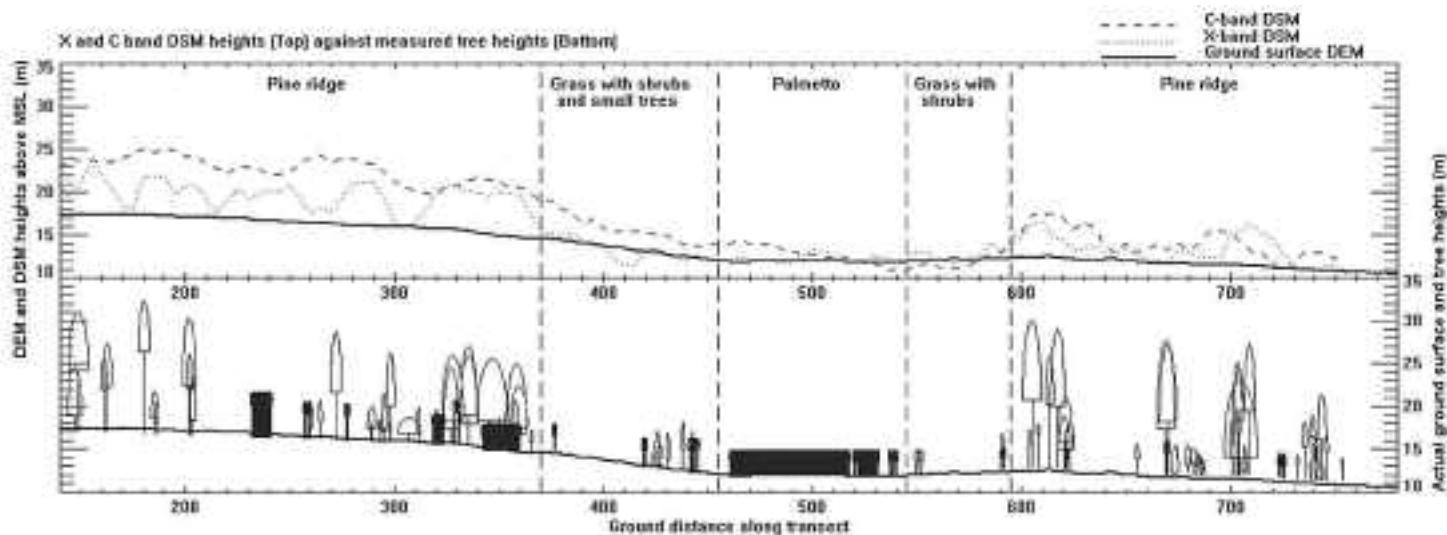
The InSAR technique estimates the height of the first surface encountered by the radar pulse. This digital surface model (DSM) indicates the height of the tree canopy, where present, or the ground elevation where no vegetation is present. By subtracting the surface representing the ground elevation (known as a digital terrain model or DTM) from the surface representing the canopy height, one can estimate the height of the vegetation above the ground. Future radar sensors will be able to derive both of these surfaces remotely. The airborne sensor used by the team produces a response only from the first surface, so they generated a surface for the ground elevation under the tree canopy by conventional topographic survey methods.

The ground survey collected a number of physical parameters for each tree, palm and shrub within the study transect. These were: three-dimensional position (eastings, northings and ground height of bole) of each tree, diameter of trunk at breast height (1.3m above the ground), tree height, crown width and also the height of the bare ground at a sufficient density of points throughout the transect area to allow a DTM to be produced by an interpolation technique known as *kriging*. The DTM was then subtracted from the radar DSM representing the vegetation canopy to give the estimate of the vegetation height by radar.

What did they find?

For this work, the researchers used InSAR data at two different wavelengths: C-band (5.7cm) and X-band (3cm). The team found that when estimates of tree height derived from the radar data were compared with the observations from the ground survey, the approximate extent and an indication of relative height of the vegetation canopy was achieved. However, the tree heights estimated by the two radar wavelengths differed, with the shorter wavelength X-band producing lower estimates of canopy height than the longer C-band. This was a surprising finding, because previous studies in denser forests had found that the shorter wavelength X-band tended to give a more accurate approximation of the top of the tree canopies.

The graph on page 18 shows that the InSAR surfaces give a general indication of where woodlands occur along the transect, although, as expected, both radar wavelengths underestimate the vegetation height when compared with the ground survey data. The degree of the underestimation is not consistent, since the radar surfaces produced over the trees occurring from 600 – 800m along the transect are lower than the radar surfaces sensed over the trees from 0 – 300m, despite both woodlands actually containing trees of similar height. »



Transect (or cross-section) of the study area showing the measured vegetation heights (bottom and right axis) compared to the radar estimated heights (top and left axis)

The reason for this is uncertain; it may be due to attenuation of the radar beam at longer range, or to the relative amounts of ground and trees that the radar pulse interacts with in the different parts of the transect. If the area is more open, allowing the radar pulse to penetrate to the ground more often, the surface that is produced will have a lower elevation. Although the woodland at 600m along the transect has some taller trees, there are also several wide gaps between these trees where the radar would have penetrated to ground level.

The finding was that, in these open savanna woodlands, the InSAR technique underestimates actual tree height, but not in a way that can be systematically explained at this time. Nevertheless, the positive correlation between the surveyed positions of trees and the peaks in the InSAR surfaces suggests that it is generally possible to identify the presence of the tree canopy using InSAR data.

There are various ways of converting estimates of tree height into estimates of biomass and the amount of carbon stored. If height alone is used, biomass is often estimated as a power function of tree height. Applying this knowledge, the team calculated that an underestimation of 25% would lead to a 45% underestimation of biomass. Underestimating height by 50% would translate into a 75% underestimation of the above-ground biomass and carbon in these savanna woodlands.

Impact and implications

Land managers are interested in using radar remote sensing for making natural resource assessments because it greatly enhances their overview of extensive and often inaccessible areas. It allows observations to be made day or night, unaffected by cloud cover, which can impede optical remote sensing and is a particular problem in the tropics. Land managers in many countries can use these findings to make an initial assessment of how accurately airborne SAR can map the extent and height of woodland and, consequently, how accurately it can estimate the amount of carbon stored in woodlands and forests with sparse and variable canopy cover.

In 2006, the FAO reduced the eligibility criteria for classification of land cover as 'low density forest' to a canopy coverage in the range of just 10-30%. This important change now brings many areas, including many tropical savannas, into the category of forests. This recognises the potential of these areas for sequestering carbon

and may improve their chances of protection. It also opens up the prospect of new revenue streams such as woodland-related grants. Developing methods to assess a number of metrics, but particularly the carbon content of these low-density forests, has therefore become more urgent.

Prior to this study, there was a pervasive assumption that InSAR could be used to retrieve the height of most vegetation canopies. In fact, that was an assumption that had been extensively tested only in dense plantation forests. This research has shown that in sparser heterogeneous woodlands, the method can be used to estimate the general extent of vegetation canopies, but cannot reliably quantify tree height, which is underestimated by the radar. However, in a practical context, comments from local land managers in Belize have suggested that, although not ideal, even an indication of vegetation location and height further aids their understanding and management.

At a time when satellite-borne sensors are being launched to estimate vegetative biomass and carbon storage at a global level, this work underscores the risk that canopy heights and biomass in savanna areas could be underestimated by current sensors and processing techniques. Any such underestimation might in turn lead to these regions being considered a lesser priority for conservation as a global carbon store. This could lead to the loss of large areas of savanna and the release of stored carbon into the atmosphere, exacerbating climate change.

Report by Amy Roberts, RICS research officer. Funding for this study was provided by the RICS Education Trust www.rics.org/educationtrust Karin Viergever's fieldwork was supported by the Carnegie Trust and the Royal Scottish Geographical Society



The potential of synthetic aperture radar for assessing carbon storage in savanna woodlands is available at www.rics.org/research

This article was previously published in the July/August 2008 issue of the RICS Land Journal

Like your style

Clive Warren FRICS, RICS Oceania Facilities Management International Faculty representative, describes Corporate Asset Management – the Australian way

Asset managers in Australia, like those in most developed countries, fulfil a significant strategic link between an organization's business objectives and the world of real estate markets. The message that good strategic asset management can add value to the organization through increased productivity and sound real estate investment, has taken some time to gain momentum in the region. However, the majority of large corporations are beginning to actively address the issue.

The push for change to strategic asset management planning in Australia came principally from the reforms undertaken in the public sector during the mid-1990s. At this time, most large public and private sector organizations were feeling the wind of change brought about by economic rationalism. It was also attributed to the pressures of increasing competition, pushing organizations to become ever more efficient in their production processes in manufacturing or in the service sectors.

The government sector is one of the largest occupiers of office accommodation in Australia's major cities and with this large portfolio to manage, it is little wonder that it was these major portfolios that led the way in asset management reform. Many state governments' initial reaction, it seemed, in the face of federal government measures, to require greater competition within government procurement, was to contract out most of their non-core functions including asset management. The Federal Government even went so far as to divest itself of virtually all of its freehold property on a sale and leaseback. Other state governments took a more measured approach, introducing competition within the existing departmental structures.

The rapid change to a commercialised asset management paradigm within government did result in some poor outcomes in some jurisdictions, however, the disciplined approach of the public sector led to the development of a series of comprehensive asset management guides and procurement protocols. This rigorous approach, coupled with the discipline that contracting out brought to many of the larger contractors, has delivered considerable gains across all sectors. Most large corporations have now developed detailed asset management strategies which link with the business objectives of the organization.

The synergy between property asset management and successful business planning has seen the number of skilled corporate real estate managers increase in senior strategic planning roles. An asset manager's role is no longer one of just monitoring costs and seeking to free up underutilised space. It involves proactively seeking input from divisional managers to formulate, on a quarterly basis, future staffing and thus workspace requirements, and linking production to location and space demands.

This structured approach to workspace requirements, seeking quarterly projections over a one to five-year time frame, allows the asset manager to collate all existing and future property requirements into a strategic asset plan that meets the rapidly changing demands of business with a solution that has the right mix of flexible, rapid response, short-term accommodation with the longer-term, often freehold assets which the company uses as its base.

The changing nature of workplace design is placing ever increasing demands on the strategic asset planning process. The shortening product life-cycle means business decisions change more rapidly. And with a global market and changing work patterns, the strategic asset plan needs to address issues of rapid expansion, as projects take on new strategies which incorporate the 'follow the sun', 24/7 working practices adopted by many organizations. Added to this change in strategic asset planning, the Australian property sector is facing an increasingly demanding occupier.

The high employment figures in most Australian cities means that HR departments are struggling to find and retain the right personnel for organizations. The role of asset management in providing the most efficient workspace is changing to one that seeks to provide the most *effective* workspace. These not only provide a cost-effective solution which meets the business planning objectives of the organization, they also meet the requirements of the staff that occupy the space. Staff satisfaction leads to higher productivity and staff retention which, in turn leads to an overall better asset management outcome for the corporation.

Clive Warren FRICS
RICS Oceania Facilities Management International
Faculty Representative

The shortening
product
life-cycle
means
business
decisions
change
more rapidly

This article was previously published in the February/March 2008 issue of the RICS Commercial Property Journal

From small acorns

James Zack FRICS discusses why construction projects continue to fail and looks to the future of the profession if current trends aren't reversed

Some things never seem to change. As a construction claims consultant for 30-plus years, I've examined hundreds of 'failed projects' – projects that finish late, over budget, and/or lack the quality the owner thought they procured. During forensic analysis, all too often the problem is not technical but simply a lack of competent, skilled people.

A shortage of people in construction (professionals, trades and crafts) is not new. In his book *How the Great Pyramid Was Built*, Craig B. Smith¹ debunked the 'army of slaves' idea. He concludes that the pyramid was constructed by "willing workers" with the "necessary skills". Even 4,000 years ago, the construction industry had concerns about competent, skilled people.

Today we face a larger crisis. A recent ConstructionSkills survey² reported that:

- 70% of mothers and 50% of fathers did not know the construction industry is one of the nation's largest employers
- only 40% of parents said they would be pleased if their children were interested in working in any aspect of the construction industry
- a mere 20% of parents believe that the construction industry offers a wide variety of career opportunities
- only 4% of parents rated 'construction site manager' as a preferred career option for their children.

How can an industry that provides so much to society be looked down upon so much? Look out of any window. Try to find something the construction industry was not involved in.

The inevitable result of this trend is that in a few decades we may have more educated, computer literate people who have no idea how to fix plumbing, run a new electrical circuit, design a home addition, etc. This trend has already started to overtake us in the United States. Last year, at college graduation time, *USA Today* reported that more students in the US graduated with sports therapy degrees than engineering degrees. The US Bureau of Labor Statistics reports that the construction industry needs 1m new workers in the next six years and 2.4m by 2014. Note that this report deals only with trade and craft workers in a single nation. Imagine the total need (professional, trade and craft) globally?

What can be done to change this dynamic to avoid the coming crisis? The entire industry (owners, engineering/architectural/construction management firms, contractors and sub-contractors, unions and professional associations) need to work together to 'sell' our industry as a place to make a good living and help all of society. Some ideas that have surfaced include the following:

- participation in math and science fairs, and 'future city' competitions at early grade (primary) school
- volunteers to visit schools at all levels to help teach youngsters that math and science are wonderful things – not something to be avoided
- take industry technology (CAD systems, 3D and 4D systems, laser survey systems, high-tech training module systems) into schools to get youngsters interested in construction, engineering, architecture, project controls and quantity surveying
- invite appropriate classes to visit engineering and architectural offices and construction sites
- participate in career days, fairs and awareness days, and increase scholarship funding
- in the US, and perhaps elsewhere, lobby educational authorities to return technical and vocational classes (woodworking shop, drafting class, metals shop, etc.) to the educational system at the middle and high school (secondary) level. Many engineers I know were initially enticed to their profession by a technical or vocational class teacher.

As these ideas succeed, more people will enter the construction industry. As this happens, employers will need to concentrate on training these new people to entice them to stay in the industry and help them build a career ladder.

Why do construction projects continue to fail? Experience teaches us that such failures are generally caused by a lack of competent, skilled people in sufficient quantity on a project. Unless the industry can turn around its image, this trend will continue and even more projects will fail.

References

¹ Smith, Craig B., *How the Great Pyramid Was Built*, Smithsonian Books, Washington DC, 2004

² *New research reveals the scale of the challenge faced by industry to become a first-choice employer*, ConstructionSkills, April 07, www.constructionskills.net



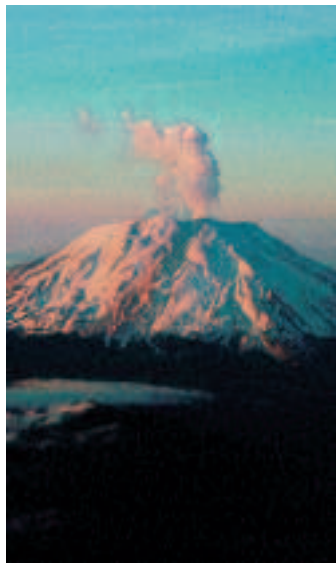
Even 4,000 years ago, the construction industry had concerns about competent, skilled people

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Keeper of the fire

Trimble GPS monitors Mount St. Helens



Twenty-five years ago, the worst volcanic disaster in US history drew the world's attention. After two months of small earthquakes, Washington State's Mount St. Helens exploded on May 18, 1980 shortly after a huge landslide – the largest in recorded history – occurred on the north flank of the volcano. The ensuing eruption decimated the surrounding area, killed 57 people and formed a deep horseshoe-shaped crater. Six years of smaller eruptions followed, creating a new lava dome. And then *Loo-wit* – “Keeper of the Fire”, as the mountain was known to area Native Americans – returned to slumber. In all, St. Helens' elevation dropped from 9,677 ft to 8,363 ft; what was once the 9th highest peak in the state was reduced to the 30th highest peak.

In September 2004, the mountain reawakened. Since mid-October, lava has been continually expelled, building a lava dome that is higher than the Empire State Building in the volcano's crater, leaving scientists and others wondering when the next major explosive eruption will occur.

“In geologic time we may be just seeing a continuation of the 1980 eruptions,” Cynthia Gardner, scientist-in-charge of the US Geological Survey's (USGS) Cascades Volcano Observatory in Vancouver. “The material we're seeing today isn't significantly different from that of 1980 and centuries from now, we won't be able to tell that there was a two-decade pause in eruptive activity.”

Helicopters are used to deploy receivers, which are set up on benchmarks to collect data as part of campaign GPS.



Whether a new eruption or a continuation of the 1980s event, Mount St. Helens is being closely monitored – and Trimble GPS is helping USGS gain more accurate predictive capabilities: reading geological ‘messages’, gaining real-time deformation information and potentially saving lives.

Scientists first used campaign GPS – GPS data gathered during scheduled ‘campaigns’ – to monitor Mount St. Helens in the mid-1990s. Today, GPS is used in three interrelated ways: campaign, continuous and on ‘spiders’.

Continuous monitoring

The mountain currently has 14 permanent Trimble GPS reference stations located in areas of just a few kilometres to up to 20 km away from the volcano's ‘vent’ or mouth. Five of these stations are Trimble 5700 GPS receivers set by USGS and nine are Trimble NetRS GPS receivers set by UNAVCO, Inc. for its Plate Boundary Observatory (PBO) network. Most stations are within 20 km (12 miles) of the mountain; the farthest is about 100 km (60 miles) out.

Data from the stations are downloaded every hour for daily analysis of accumulating deformation associated with the eruption and as a check on flank stability. If magma is entering the volcano, the flanks may start to move outward, which is what happened prior to the 1980 eruption, according to Michael Lisowski, USGS geophysicist. The more lava, the greater the risk of eruption. Since October, however, there has been only minor flank movement.

“We're talking about a few millimetres a month from continuous GPS monitoring,” said Lisowski. “If a major explosive eruption were building we would expect more movement – and other signals such as an increase in gas, which is the real source of an explosive volcanic eruption. We'd then push GPS data more towards real time. We haven't done that yet – and that's a good thing.”

Campaign GPS

USGS also uses Trimble 5700 GPS receivers for campaign GPS; the campaign schedule has been increased since October. Receivers are deployed by helicopter or by driving and hiking and are set up on benchmarks to collect data for a few days, the data is then postprocessed and compared to baseline studies.

"We use everything we have on the campaigns, including our older Trimble GPS receivers," said Lisowski. "The 5700's low power allows us to run it longer with less battery usage. We can run a 5700 for about twelve days using a small solar panel and battery."

Campaign GPS also monitors the volcano's flanks to check stability and determine whether magma is accumulating in a shallow chamber. The campaign GPS data supplements the continuous GPS data by increasing the density and coverage of deformation monitoring. The last major campaign, taking a full set of measurements at 50-60 benchmarks, was completed in 2003. A partial set of 15 benchmarks was taken after the start of Mount St. Helens' current activity. USGS took another partial set in late summer; results were not available at the time of going to press.

"With infrequent measurement, there are large uncertainties in campaign GPS," explains Lisowski. "Deformation over short time periods is harder to determine, especially when we're talking about the slow deformation rate currently occurring."

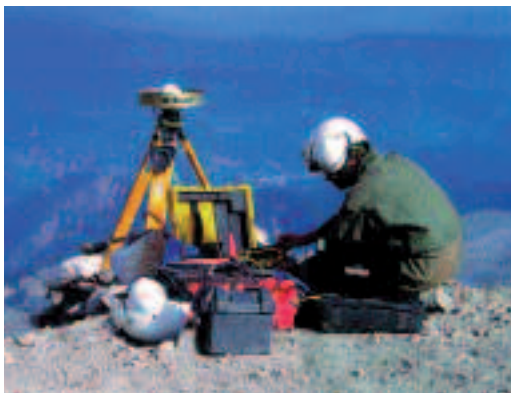
And then there are spiders

'Spiders', the brainchild of USGS volcanologist Rick LaHusen, are informally constructed devices comprising a single-frequency GPS card, antenna, controller and radio modem. Spiders are 'slung' directly into the volcano's crater by helicopters to collect information on dome growth: where it is, how fast it's growing and its direction and length. Because of their hazardous location, many spiders are lost in landslides and other volcanic events. However, their simple construction makes them easy and inexpensive to replace. Today, five spiders are perched on Mount St. Helens' dome.

'Spiders are deployed in dangerous areas where people can't go,' says LaHusen. 'They're less risky and offer good accuracy for short base line monitoring. We like to have quite a few in the small area right around the volcano.'

Spiders provide the most real-time information; set on the lava extrusions at the source, spiders can show lava movements of several metres a day. Each spider is connected to a central office computer and the network polled daily at 30-minute intervals. Software developed by LaHusen prompts the spiders to turn on the radio, log data and turn back off, saving power and time; if nothing is happening LaHusen turns down the duty cycle.

All GPS data is available via a website to all USGS scientists and collaborators. It is analysed daily and discussed at meetings by USGS specialists three times a week. (See <http://quake.wr.usgs.gov> and follow links to research on deformation. Results are in real time).



Scientists are closely monitoring Mount St. Helens to keep an eye on what she might do next

"We discuss what we're seeing with deformation, seismicity, gas and geochemistry," explains LaHusen. "Put all together, it gives us the story of what's going on and what might happen."

The biggest difference between the current eruption and that 28 years ago is that the 1980 eruption was very gas rich and this one is not. "There's an amazing amount of material moving out there and we have to watch it very closely to see if things change. If you start getting more rapid deformation or changes in deformation trends, then you look at gas and seismicity. We're not there yet," cautions LaHusen.

Today, *Loo-wit* continues to let scientists and local residents know she's awake. What she'll do next is being closely watched – by USGS scientists and Trimble GPS.

...building a lava dome that is higher than the Empire State Building...

Where is she now?

Since the article was published in September 2005, lava domes grew continuously throughout 2005 and into January 2008. During that period, several transient rock formations were observed, most remarkably a long extrusion of solidified lava that resembled an enormous breaching whale. The extrusion rate of the 'whaleback' was measured at 10 metres per day by placing a GPS spider on its top. Typically, these fragile devices failed in rock avalanches that sent ash clouds hundreds to thousands of feet into the air above the crater. Mount St. Helens also produced several unpredictable explosions that sent steam and ash clouds aloft, such as the one on March 8, 2005, when a 36,000-foot (11,000m) plume of steam and ash emerged – visible from Seattle, 100 miles away.

As lava continued to erupt into the crater, several permanent GPS stations around the volcano moved inward, indicating a gradual draining of the stored magma. Gradually, the eruption rate slowed until January 2008 when the magma extrusion rate became imperceptibly small. High resolution borehole tiltmeters in the crater sampled at one second intervals provided additional deformation records that correlated well with GPS and seismic records indicating declining lava production.

Throughout the eruptive episode, frequent very small but repetitive earthquakes occurred and were interpreted as stick-slip motion of the extruding solidified lava. This drumbeat of minor quakes was occasionally punctuated by larger earthquakes that sometimes triggered rockfalls and associated ash plumes.

This article was previously published in the May/June 2008 issue of RICS Geomatics World

Building back better with BuildAction

Mark Goodwin explains how surveyors can help to rebuild lives in the wake of major disasters. The skills that are needed are generic, mainstream skills, not disaster recovery specialisms



RICS has achieved unprecedented access to international organizations through the work of its Commission on Major Disaster Management. It has forged links with the United Nations, World Bank, World Economic Forum and major charities. RICS is also opening up opportunities for members in this 'Third Sector' as well as fulfilling its public interest role – the very essence of a Royal Chartered body.

What's the problem?

It may seem self-evident that the poor are worst affected by major disasters, but few realise how much harder poor communities are hit, particularly in densely populated areas. For example, in 2003 an earthquake measuring 6.5 on the Richter scale hit central California, killing two people and injuring 40. Four days later in Iran, a quake rated 6.6 killed 40,000, because of the less resilient buildings there. The poor also have the least capacity to respond and recover after a disaster.

The 2004 Indian Ocean tsunami alone resulted in rebuilding costs estimated at around \$10.3 bn. Over 2m people were displaced, and over 390,000 houses reduced to rubble, yet by 2006 only 46,000 houses had been built or were under construction.

There is also compelling evidence that two factors are worsening the situation. First, there is a relentless move of the world's population away from rural living toward denser urban concentrations. It appears that for the first time in history, the urban population is greater than the rural. Many of these

urban areas are of low quality construction and in vulnerable locations, being largely coastal, estuarine or in active seismic areas. The second factor is climate change, which is generally accepted as helping to generate increasingly severe storms and unpredictable weather events. The number of hydro-meteorological events has more than doubled since 1996. The resulting major disasters are happening with greater frequency and are affecting more people, particularly the poor.

Mind the Gap!

Following the Indian Ocean tsunami there was a huge need for reconstruction over a wide geographical area. Yet despite an unprecedented amount of funding through private, organizational and government donations, far too little has been directed to the professional management and practical delivery of reconstruction. Extensive talks with the humanitarian relief community confirmed the urgent need for the involvement of construction professionals, both in post-disaster reconstruction programmes and during the preparedness and risk-reduction phase.

Chartered surveyors working in Sri Lanka, Thailand and other countries hit by the tsunami reported an apparent 'gap' between the immediate humanitarian relief phase, and large-scale reconstruction. The RICS Major Disaster Management Commission asked the Max Locke Centre at the University of Westminster, UK to

investigate this anecdotal evidence, and test it against analysis of the experience following earlier major disasters. The resulting report, *Mind the Gap! Post-disaster reconstruction and the transition from humanitarian relief* revealed overwhelming evidence of a gap in funding, management and delivery between short-term (largely effective) humanitarian relief and permanent reconstruction.

Wanted: built environment skills

Talks with various UN agencies, the World Bank, and major charities, have shown that built environment skills are all too often under-recognized in the disaster management world. There is a need for assistance at both a strategic planning level, and on the ground. Several projects have been successfully placed, some *pro bono*, others on a commercial basis. The Commission itself has been able to offer general advice, and to publicise opportunities for members to get involved. This work is being formalised through an RICS initiative called BuildAction, matching built environment professionals and the humanitarian aid community to help with disaster related projects.

Corporate Responsibility

Many firms have been keen to get involved in BuildAction to help disaster afflicted communities, not only because it offers a highly relevant and worthwhile way to demonstrate a commitment to Corporate Social Responsibility (CSR), but also it provides them with a competitive advantage in 'the war for talent'. The possibility of working on a disaster preparedness or reconstruction project presents a powerful benefit in terms of recruitment, retention and development of professional staff.

RICS involvement

Sadly, we have already experienced large-scale major disasters in 2008. In the last two months, Cyclone Nargis in Burma and the earthquake in Sichuan Province, China have created massive devastation and destruction; impacting thousands of individuals, local communities and the countries themselves.

It will take many years to rebuild and recover from the effects of these disasters; but, through the efforts of the RICS BuildAction initiative and the Major Disaster Management Commission there is a strong commitment from RICS to bring disaster management to the attention of surveying firms and individual professionals and to ask the question: how can you get involved to help build back better?

RICS Major Disaster Management Commission objectives

- Make a valuable, practical and sustainable contribution to the public good, in accordance with the Institution's Royal Charter obligation, through assisting disaster-affected communities and those working with them
- Form a key plank of a wider, integrated programme of corporate responsibility for RICS and the profession
- Promote a positive image of RICS and an influential global network of expert and public spirited professionals
- Engage members and their organizations through a cause which is both inspiring and good for corporate image and business development
- Add an attraction to potential recruits to the profession.

Call to action

If your firm is interested in signing up to the BuildAction initiative, please contact Emily Darko: info@buildaction.org.

For more information see www.buildaction.org.

View the *Mind the Gap* report: <http://www.rics.org/mindthegap>

Mark Goodwin

**Special Adviser to the CEO, RICS
Director of the RICS Major
Disaster Management Commission**

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Lending a Hand

As has been shown, disaster recovery is a global issue. The case studies below illustrate how RICS members across the world can use their professional skills to rebuild communities and infrastructure to create a brighter future for disaster afflicted areas.

- **Volcano damage in Montserrat** – Following the 2002 volcano eruption in Montserrat, the UK Government's International Development Department (DFID) employed a chartered surveyor as a project manager for the reconstruction effort. Part of his remit was to carry out, and teach the local contractors, estimating, tendering and general financial management.
- **Flood Recovery in Sudan** – A chartered quantity surveyor co-ordinated the Sudanese Ministry of Finance Emergency Flood Reconstruction Programme for the construction of new schools in Sudan. He was responsible for the field implementation of US\$17m World Bank project. Duties ranged from preparing tender documents and procuring building materials to overseeing construction works and training local personnel.
- **Land Rights in East Africa** – A chartered planning and development surveyor worked for UN Habitat, carrying out a review of tribal and colonial land rights in East Africa and how these affect the planning system. She spent further time assessing shanty town improvement schemes in Nairobi and Kampala, looking at land rights, services, access; and the work of some of the more successful community self-help groups in housing construction.
- **Bills of Quantities in Aceh, Indonesia** – In July 2007, an Indonesian chartered surveyor provided valuable quantity surveying guidance to an international NGO building a school. Able to draw on previous construction disaster experience with the British Red Cross, Aussie Aid and other local humanitarian organizations, the surveyor prepared Bills of Quantities and provided specialist advice regarding materials that were both suitable for the region, and disaster-appropriate.

Uncertain values

Mark Gerold FRICS, chairman of the RICS Valuation Standards Board, advises chartered valuation surveyors on how to value in uncertain market conditions

Since summer 2007, many global markets have passed from growth to decline, the UK commercial and residential real estate markets have not been excluded from this change. Numerous articles have highlighted why this has come about, but what is the best way best for valuation surveyors to tackle this change in the market?

It is clear that values go down as well as up – that is the nature of market cycles. However, it is predicting the cycles' timing that makes or breaks fortunes. For many practicing valuers, this is likely to be the first time they too had to make judgements in a falling market. In an active market, when properties are changing hands on a regular basis, this judgement should be no more challenging when values are declining than when they are rising. It is all about observing the movement in value from transactional evidence in the market place.

The valuer should apply extreme caution in adopting such a position unless it is patently obvious that circumstances prevail to make such a conclusion inevitable

So why be concerned for the present? The point of market change can be characterised by a period of hiatus – it stalls. This could either be a period of taking stock/consolidation, and then continuing to grow or – and this is where it does get difficult – the period before it then moves into decline. It is during this period that the valuer will be most challenged in reaching a judgement upon value.

At the end of December 2007, we clearly experienced a hiatus. The general sentiment was the level of market inactivity might last slightly longer before returning to a volume of transactional activity sufficient to sustain reliable or observable comparable evidence. But that does not mean that there is insufficient evidence for the valuer to reach a judgement – just that there is less of it. And this may result in the value reported being less certain than before.

It is during this period that valuers may come under great pressure as their judgement is likely to be examined far more closely given the possible absence of observable evidence. Absence of transactional evidence or low volume of evidence does not provide an excuse to maintain the last observed value level, as this may be historic. The valuer must interpolate a whole range of issues to reach a conclusion.

Most importantly of all, valuers should brief a client upon the degree of certainty attached to the valuation. The figure is only part of the output of a valuation process. A substantial part is the advice given with the figure, briefing on the market conditions and

aspects associated with the property which are relevant to a risk assessment. The latter is particularly important in loan security situations where there is a full opportunity for the valuer to provide a detailed briefing on issues such as market inactivity leading to an absence or low volume of evidence – which then results in the valuation being less certain than when a market generates a normal volume of transactional activity. It is ultimately for valuers, and is part of their job, to interpret market conditions as well as specific evidence.

This is then a question of how to reflect certainty in valuation. There has been much debate as to whether or not we are experiencing a period of abnormal uncertainty and whether valuations should be expressed against that caveat. The valuer must apply extreme caution in adopting such a position unless it is patently obvious that circumstances prevail to make such a conclusion inevitable.

Since the present credit crisis began, the market has continued to function but at very much lower volumes than had been experienced in times. Just £1.2bn property transactions were recorded in October 2007 a massive decline from the July 2007 total of circa £8bn. One has to refer back to 2003 to find such a low monthly total. And November 2007 was on track to appear lower still. The markets are functioning but with greatly reduced levels of activity. This requires the valuer to ensure they not only thoroughly investigate all available transactional evidence, but also consider whether or not to accompany the valuation with attaching a statement about the degree of certainty.

Guidance Note 5 (GN 5) from the *Red Book* 'Valuation Uncertainty' is designed entirely for such circumstances.

Guidance Note 5 assists the valuer in addressing issues of uncertainty under a number of headings – nature of property or location, restrictions on enquiries or information provided, method of valuation, hope value, legal changes and market instability.

It is the degree of confidence which the valuer has in his/her valuation that should be expressed in circumstances where, due to market instability, it is important that a client is advised upon the degree of certainty inherent in the valuation.

It appears valuers are simply experiencing the effect of a free market cycle – who said valuation should be straightforward and easy? It is in such circumstances that the valuer needs to demonstrate their skills of judgement and interpretation, and ignores the guidance provided in GN5 at their peril.

Mark Gerold BSc FRICS
Chairman RICS Valuation Standards Board
Director at Atisreal Ltd.

This article was previously published in the February/March 2008 issue of the RICS Commercial Property Journal

The battle for biodiversity

Farmland species are becoming rarer, despite 20 years of investment in schemes to reverse the decline, reports Anne Liddon

The public perceives the countryside as a place where wildlife thrives, but over the last century, it is technology that has flourished, while biodiversity has been in decline. More intensive farming, involving artificial fertilizers, improved crops, pesticides and a high degree of specialisation, has changed the landscape. Soil erosion and pollution have also played their part, and in some cases, habitats have disappeared completely. Consequently, many farmland species that were once a common sight, such as cornflowers, the chalkhill blue butterfly, skylarks and hares, have become much rarer.

Since 1987, hundreds of millions of pounds of public money have been spent on agri-environment schemes (AES) in the UK, with the aim of reversing this decline by encouraging farmers to promote greater biodiversity on their farms. But this expenditure has not always had the desired effect, and the question is, why? Are farmers genuinely committed to nurturing wild flowers, birds and insects, or do they regard the schemes as a means of subsidizing the real business of farming?

Now the Rural Economy and Land Use (RELU) programme is funding a five-year project by the Natural Environment Research Council's Centre for Ecology and Hydrology (CEH) and staff from Exeter and Reading Universities, to find out why the AES programme has been more successful at maintaining bio-diverse habitats than rehabilitating degraded sites.

The researchers, led by the CEH's Dr James Bullock, think there are two main reasons for this. Firstly, farmers might not have sufficient understanding of the science behind the schemes and how to get the best out of them. Many participants might have been attracted by the AES payments, believing they could fulfill the requirements within the existing farming system. And they might be opting for the easier option of not doing things (for example, leaving land without fertiliser), rather than engaging more positively and fully with the aims of the schemes.

Secondly, the landscape itself might present problems. Even if the farmer is creating appropriate habitats, there might not be populations of animals and plants near enough to colonize them, or physical barriers might be getting in the way. These issues need to be taken into consideration to ensure the best possible results.



© Claire Carvell

The populations of these two bumble bees (left, *Bombus pascuorum* and right, *Bombus lapidarius*) are being measured as indicators of the success of agri-environment schemes

The researchers are keen to find out whether the training of farmers would make a difference to the success of the schemes. They have selected 24 pairs of similar farms, all of which are part of the entry-level Environmental Stewardship scheme in the south-west and east of England. One farmer in each pair receives training in habitat management, while the other does not.

Across the pairs of farms, the researchers are mapping the landscape structure and measuring key indicators, such as numbers of bumblebees and butterflies, feeding by winter birds and flowers setting seed. They aim to explore the different attitudes of farmers, how their own knowledge and farming background influences the success of the schemes, and the effects of undergoing the training. They have found that those taking part are generally committed to being 'good farmers', but they might need to include in that concept the idea of being a steward of the land and the wildlife that lives there, as well as being an efficient food producer.

As James Bullock says: "Early results seem to show that farmers respond very positively to training, which suggests it could make a big difference to the success of the schemes. We are now waiting to see whether this translates into biodiversity increases.

"It may be that expecting farmers to undertake this kind of environmental stewardship without any kind of support is unrealistic. Farmers are already working within a range of social, financial and ecological constraints. This is just another demand on their time and energy."

The AES programme has been more successful at maintaining bio-diverse habitats than rehabilitating degraded sites

This article was previously published in the April/May 2008 issue of the RICS Land Journal



For more information, visit the RELU website www.relu.ac.uk

A question of transport

Everyone wants more investment in transport infrastructure, but can new railways and roads pay their way by increasing private property values? The latest research gives a qualified thumbs up to land value capture initiatives

Back in October 2002, RICS, the then Office of the Deputy Prime Minister and the Department for Transport published the *Land Value and Public Transport – Stage One* report, which assessed the relationship between land use, land value and public transport. The research team developed a draft methodology to test how movements in value as a result of new transport infrastructure could be measured.

Stage Two, published two years later, used both qualitative and quantitative techniques to test this draft methodology on the Croydon tramlink. Local opinion at the time suggested that the development of new transport infrastructure increased property values and improved the public perception of Croydon, nr London, England.

This area of investigation has continued to receive attention. In the latest publication in the RICS Research Paper Series, Grace Hongbo Du and Corinne Mulley of Newcastle University used Tyne and Wear and its Metro railway as a case study for the assessment of transport accessibility and its impact on land value, as expressed in residential property prices.

Motivation

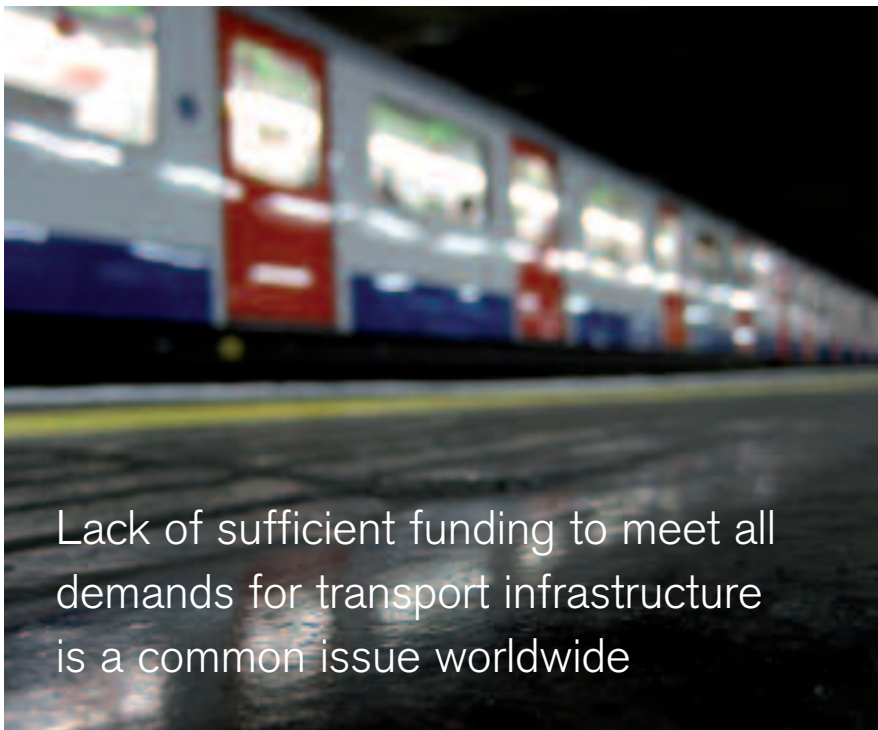
Classical urban land economics identify a trade-off between transport cost and land rental, which explains why a parcel of land located in the city centre, where transport costs are minimal, has a higher value than a parcel of land located on the outskirts of the city. With the development of economies, the demand for mobility grows and substantial investment is required from governments to fund the necessary infrastructure. However, there are many competing demands on public funds and lack of sufficient transport infrastructure funding to meet all demands is a common issue worldwide.

In the UK, one proposed solution is a policy based on land value capture (LVC), the concept that increases in private land values generated by new public investments are all, or in part, captured through a land-related tax that will pay for that particular investment or other public projects. Various tax-based and betterment-based approaches have been explored as possible mechanisms for financing transport infrastructure. But underlying the debate is one fundamental question: 'To what extent can transport infrastructure uplift land value?' This is the question that Hongbo Du and Mulley tried to answer.

Methodology

Many property studies use hedonic price modelling, which assumes that the price of a house is determined by a bundle of internal features (such as the number of bedrooms) and external factors (such as the nature of the neighbourhood and accessibility to public transport) and estimates the implicit value of these. The problem with hedonic modelling is that it fails to take account of spatial dependencies: for example, the fact that one sale price influences another nearby, and the same house would sell for different prices in different areas. Since the data used is not tied to any geographic or mappable reference, it can supply only global averages, without local variations.

How misleading this can be is illustrated by the example of the relationship between the age of houses and house prices in various parts of England. Global statistics show that, overall, the age of houses does not affect prices significantly. However local variations are significant. Victorian



Lack of sufficient funding to meet all demands for transport infrastructure is a common issue worldwide

houses, for example, might be prized for their character and command high prices in some parts of England, whereas in others – particularly urban areas that expanded rapidly in the 19th century in the rush to accommodate workers – building standards might have been lower, resulting in poor condition now and lower prices.

Hedonic price modelling is a global model, so the researchers used a relatively new technique, Geographically Weighted Regression (GWR), to analyse the data. GWR can improve on global models by allowing for spatial variation or non-stationarity in the regression parameters. In short, it calibrates a hedonic global model and then produces local estimations which are plotted in map form using GIS.

The data used in this study was collected in 2004, 20 years after the opening of the Tyne and Wear Metro, a light rail service. Data was collected for the whole of the Tyne and Wear region, including areas which had benefited from long exposure to the Metro, other areas, such as Sunderland, where the Metro was relatively new, and areas with no access to the Metro at all.

Findings

1. The global model demonstrated that proximity to Metro stations could significantly increase house prices, as could transport accessibility to secondary schools. However, the local analysis provided by GWR demonstrated that the positive premiums resulting from good Metro access was not uniformly distributed. Transport accessibility had a positive effect on land value in some areas, but a negative or zero effect in others.

This means that implementation of a uniform LVC policy would produce winners and losers, but the study opens the way for more research, to gain a better understanding of who the winners and losers would be. If the UK government knew that, it could choose the location of transport infrastructure wisely, ensuring that the winners were in the relatively poor areas.

Thus, the local information generated by GWR provided scope for future research by asking as many questions as it answered.

2. In this case study, being within 200 metres of a Metro station was positive (showing a premium of £27,396, or 17.13% of mean house price) over much of the study area, but there was one notable exception: Borough, which has the highest unemployment rate in Tyne and Wear. However, there were no significant negative effects found for any house within 200 metres of a Metro station.

3. Globally, houses within 201 – 500 metres of a Metro station gained £14,193 (8.87% of mean house price) in house price premiums, compared to properties 1km away. By contrast, GWR showed significant negative premiums of £10,000 – £32,056 (from 5% to 30.38% of house price) in three areas, indicating that this proximity is not valued positively by households in these areas. Only two areas showed Metro proximity having a significant positive effect, with premiums of between £20,000 and £43,977, or between 5% and 50.46% of the house price.

4. While the global findings were that better transport accessibility to large employers reduced house price, local GWR estimations showed three areas where a one-minute-quicker car or public transport journey to large employers added a premium of up to 29.8% of house price. The positive premiums tended to fade with distance from large employers, in line with classical land theory.

5. Transport accessibility to primary schools reduced house prices by £2,454/minute (1.53% of mean house price), which the researchers assume points to some negative effect of primary schools unknown to them. In one area, being close to primary schools decreased house price by up to 46.42%. Significant positive premiums for house prices were found in just one area in the south, calling for further investigation.

6. The global model suggested that the relationship between house price and transport accessibility to further education establishments and colleges was positive. However, the GWR model showed that this was not true for most homes in Tyne and Wear, with the exception of two areas in the south east of the study area, which showed up to 8.81% positive premiums. In a large part of Gateshead and Newcastle there was a pronounced negative relationship between the two, with negative premiums of up to 50.8%. The researchers suggest that this disparity might relate to the neighbourhoods the colleges serve.

7. There were more positive and higher house price premiums around the Metro stations that had been in service for decades than there were around new SME stations opened just two years before the data was collected. This suggests that any effect of Metro on land value takes a long time to occur.

Summary by Amy Roberts, RICS research officer
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Being within 200 metres of a Metro station was positive over much of the study area

This article was previously published in the January/February 2008 issue of the RICS Residential Property Journal



The full report is available to download from www.rics.org as are the 2002 and 2004 Land Value and Public Transport reports

Mapping north

Satellite photography in north-western Iran by Andrew Anstee, Jeremy Gibbs and Anthony Denniss

Today, geologists have a range of more innovative options to acquire topographic information

While the benefits of high resolution terrain information have always been known to exploration and engineering geologists, access to such information has typically been almost impossible. Given the remote geographical location of most sites of interest to the geologist, detailed mapping is not readily available. In the past the only way to acquire information has been either to have surveyors on the ground or commission a dedicated aerial survey to capture conventional 9" film-based photography, from which detailed terrain and mapping information could be derived. However, even if cost did not prohibit such surveys, then often other factors such as local flying permissions, weather conditions or access to ground control could limit the effectiveness of such surveys.

Today, geologists have a range of more innovative options to acquire topographic information. Not only has airborne sensor technology advanced, with high resolution laser scanners and digital cameras being used to provide very accurate terrain information, but stereo satellite imagery also provides an alternative solution.

Gold at Sari Gunay

Rio Tinto recognized the need for a highly detailed elevation model to assist with a number of aspects of mine design at Sari Gunay, a sub volcanic intrusion-related epithermal gold deposit, formed within a middle Miocene volcanic complex in central north western Iran.

Sari Gunay is located at 35°12'N 48° 05'E in the province of Kordestan, approximately 60km northwest of the city of Hamedan. A region of rolling hills and semi-arid, marginal farmland, prior to the discovery of this deposit, the immediate area was not known for gold mineralisation, although small veins had been worked for antimony and arsenic. The potential for gold mineralisation at Sari Gunay was first recognized by Rio Tinto geologists in 1999 during inspection of a site containing antimony-arsenic vein mineralisation and old millstone quarries in silicified igneous rocks.

Large areas of phyllic and argillic alteration were also noted in a 16 km² area around the vein system, and samples were taken on the basis of similarities to epithermal-style mineralisation. Significant gold values were detected in vein and wall rock samples collected over a wide area, and Rio Tinto formed a

joint venture partnership with the property owner, CESCO, to explore the deposit further.

Ownership of the property exploitation licence was transferred to the Zar Kuh Mining Company (70% Rio Tinto, 30% CESCO) in 2004, and diamond drilling to date has delineated a resource of 52 Mt of oxide mineralization. The cut-off for economic exploitation is a concentration of 1.0 g/t, but at Sari Gunay there is 1.77 g/t of gold within an area of 600m by 1200m and to a depth of at least 350m. The discovery is of interest because it is the first significant gold discovery in Iran in recent years and, if developed, will represent one of the first major investments by a foreign mining company in Iran since the Islamic Revolution of 1979.

Requirement for more detailed data

During the later stages of the project evolution, in the summer of 2005, there emerged a requirement for a digital terrain model (DTM) to assist with a number of aspects of the mine design, such as mine infrastructure layout, mine dump and tailings pond locations. The published 1:50,000 scale topographic mapping was not detailed enough, having a contour interval of just 20 metres. Shuttle Radar data was useful as a first pass digital elevation dataset but was too coarse to reliably produce contours which were required for the tailings dam design.

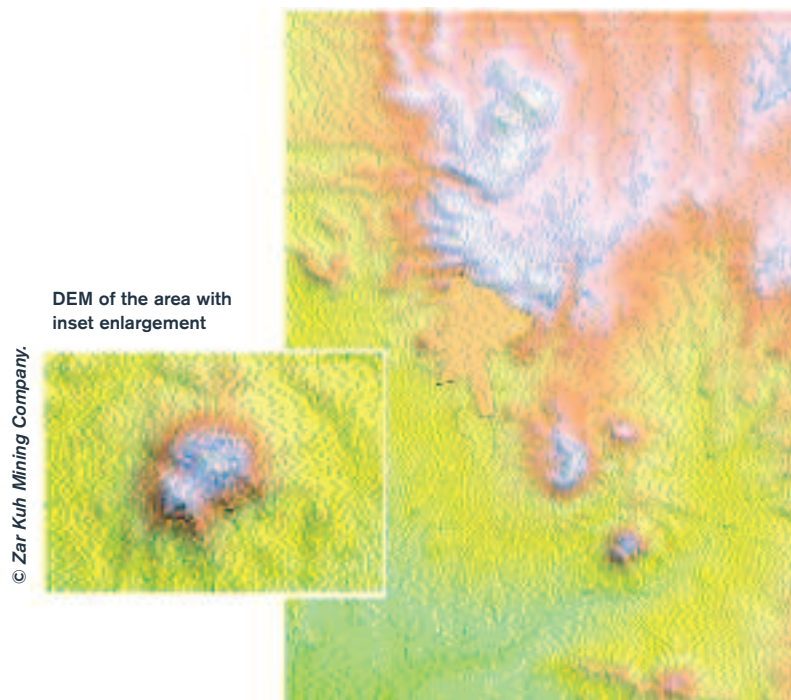
Due to the difficulties of flying an airborne survey in-country, in particular the permitting issues, safety considerations, and the sheer size of the area, it was decided that a satellite derived DTM would be the most suitable solution. The terrain with its gentle rolling hills and minimal vegetation cover lent itself well to a successful acquisition.



Satellite image of area

© IKONOS Data © GeoEye 2007, all rights reserved

The autocorrelation process views the tree canopy, whereas the operator can find gaps in the canopy or use his judgment to estimate ground level where the canopy is dense



DEM of the area with inset enlargement

© Zar Kuh Mining Company.

Taking a photogrammetric approach deploying four key components

To address the project requirements, Infoterra implemented an integrated approach, combining several photogrammetric techniques; including triangulation, DTM generation, ortho-rectification and contour generation.

The IKONOS stereo pair was loaded into Socet Set v5.3 to undergo the following photogrammetric processing.

Triangulation

As part of the import process, Socet Set reads the ephemeral satellite tracking information provided with the IKONOS imagery to position each image to an accuracy of approximately 25m. The images form an approximate stereo pair, with parallax at large viewing scales.

To remove this parallax, an automatic tie process was run. This identified common points on each image using a pixel patch correlation process which matches a patch of pixels from one image with another patch on the second image. The operator then ran a least squares bundle adjustment to refine the position of the images and remove parallax within the stereo pair, allowing parallax-free viewing. The operator then stereoscopically observed a number of GPS photo control points across the scenes, which had been surveyed in the field using differential techniques. This data was used to refine the position of the stereo pair in a second least squares bundle adjustment.

On completion of the triangulation, the operator visited a number of locations within the stereo pair

Weather conditions were also favourable during the proposed June to August 2005 acquisition window, as there is little or no cloud cover during most of the summer months.

Infoterra Ltd was contracted by Rio Tinto to manage the acquisition and processing of the satellite imagery, and in August 2005 a 1m resolution IKONOS stereo pair was successfully acquired.



3D visualisation of initial design of mine development, after 6 years and after 12 years

© Zar Kuh Mining Company

and extracted model co-ordinates of features which had been surveyed using GPS at the same time as the photo control, but had not been used in the final least squares adjustment. These were used to assess the accuracy of the triangulation process. The adjusted imagery was found to be accurate to just over 1m RMSE in geocentric X, Y and Z.

DTM Generation

Once the triangulation process was completed, the Socet Set Automatic Terrain Extraction tool was used to define an area of interest and properties of the terrain model required. Then, pixel patch matching techniques similar to those used in the automatic triangulation process, were used to build a terrain model.

... 'nextgeneration'
high resolution (1m)
SAR satellites,
such as TerraSAR-X,
can see through cloud

For this project the process was run at a resolution of 5m with no filtering, so the output was a digital elevation model (DEM), which included above ground features such as buildings and trees. An automatic post process was then used to remove individual small buildings and small areas of trees. The operator checked the whole area by overlaying the elevation model and the stereo imagery and edited any points or areas where necessary – generally areas of woodland. The autocorrelation process views the tree canopy, whereas the operator can find gaps in the canopy or use his judgment to estimate ground level where the canopy is dense. The resulting DTM was checked against the ground-surveyed control and check points and found to be accurate to 1.3m RMSE in elevation.

Ortho-rectification and contour generation

Once the DTM was completely checked, the most vertical of the two images was selected to be ortho-rectified against the DTM. The refined

estimate of the orbit of the satellite during acquisition, produced via the triangulation process and the DTM, was used to remove any positional distortions placed in the image by the underlying terrain to produce a 'map accurate' image. The 5m resolution DTM was then loaded into ESRI's 3D Analyst system where a set of 1m contours were generated.

Final use and summary

The final ortho-rectified image and DTM was used for a number of purposes including the initial mine designs and tailings layouts. For environmental and community relations work, a 3D fly-through of the initial design was also produced by draping the imagery over the DTM.

While satellite systems do not offer the precision of the latest generation of airborne laser scanners or digital cameras, they do give benefits of their own. Satellite images provide wide area coverage at a consistent quality, making them cost effective on an area basis. They also offer far fewer logistical hurdles and it is less arduous to commission satellite photography than to plan an airborne campaign.

Panchromatic satellite cameras also offer the potential to acquire imagery quicker although, like optical airborne systems, they are still subject to local weather conditions. However, this challenge will be removed through the use of 'nextgeneration' high resolution (1m) SAR satellites, such as TerraSAR-X, which can see through cloud.

About the authors

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Jeremy Gibbs joined Rio Tinto in 1994 as a database and ore resource geologist and since 2002 has been the in role of GIS and remote sensing specialist for the Africa Europe Exploration region. Jeremy's academic background is in mining geology and exploration geophysics.

Dr Anthony Denniss is the Technical Director for Infoterra Ltd, responsible for in-house R&D and new product development, as well as the evaluation of new mapping technologies and sensors. Anthony's academic background is in cartography and geological remote sensing.

Reference:

"Geology of the Sari Gunay Epithermal Gold Deposit, Northwest Iran" Economic Geology, Bulletin of the Society of Economic Geologists, Vol. 101 December 2006 No. 8:

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Shifting sands

As global warming and extreme weather conditions put pressure on the coastline, RICS believes technology is our best bet for rapid, efficient monitoring of change

With the costs of the summer 2007 flooding in the UK estimated at £2bn, it is clear that techniques for monitoring the coastline have to be improved

The English coastline has been extensively developed, often with little consideration for the natural processes that are constantly affecting it. In fact, insufficient management of coastal erosion in the past has resulted in a coastline that is now difficult to manage in many places. This is of increasing concern, particularly in relation to a predicted rise in sea levels as a result of climate change.

The coastal environment is an important asset and its condition needs to be carefully monitored to improve understanding of the forces at work on it and to ensure management is effective. Over the past 10 years, shoreline management plans (SMPs) have been implemented by the UK government in England and Wales as part of a strategy of undertaking large-scale risk assessments, with a view to setting up a long-term policy framework to reduce the risks. In March, government took the next step and launched the white paper that will eventually lead to a new Marine Bill. The white paper, entitled *A Sea Change*, covers planning in the marine area, licensing activities, marine nature conservation and fisheries management and proposes the formation of a new marine management organization. In June, Ian Pearson, minister for climate change and environment at Defra, announced that the Environment Agency will oversee management of all flood and erosion risk on the English coast, working closely with local authorities. The role and membership of Regional Flood Defense Committees will also be widened to include coastal erosion, bringing the Environment Agency's decisions and activity on coastal erosion

within the same governance framework that currently applies to flooding.

In its response to the draft Marine Bill, RICS recommended the government set targets for adopting new technology to obtain more accurate data about changes in the coastline 'in order to be better informed on the marine environment'.

To promote this, RICS Education Trust funded Drs David Barber and Jon Mills of Newcastle University to investigate the use of a ground-based mobile mapping system (MMS) to collect data along a 7km stretch of coastline at Filey Bay, North Yorkshire. They compared this data with a similar dataset collected by airborne laser scanning (ALS).

The background

In the past, scattered periodic measurements were used to survey coastal change, but these have largely been replaced by airborne surveys using photogrammetry and/or airborne laser scanning (ALS), which provide data at a higher spatial resolution.

While terrestrial laser scanning is becoming common in the survey of natural landforms, static ground-based laser scanners are limited in the speed at which they can be used to capture data over long distances. This problem is more evident when surveying coastal areas, as data collection is often required between tides, meaning time is of the essence.

Airborne laser scanning (ALS) provides a more rapid collection of terrain information over much larger areas than ground-based laser scanners, but can be difficult to deploy quickly as it is reliant on favourable weather conditions.

Despite their widespread use, neither of these techniques provides an adequate solution in situations where it is necessary to measure change in a short timeframe, or immediately after events such as major storms or floods. With the costs of the summer flooding currently estimated at £2bn, it is clear that techniques for monitoring the coastline have to be improved.

To overcome some of these limitations, especially in corridor environments, such as coastlines, or over rail or road networks, where data capture is required along a narrow strip, ground-based laser scanners have been mounted on vehicles to increase the



Erosion has brought this coastal road in Suffolk to an abrupt end 40ft above the beach

mobility of their sensors. Combined with a global positioning system (GPS), which provides information on the exact location of the scanners, this is 'rapid-static' laser scanning, so-called because it increases the speed at which a survey can be carried out.

There is even greater potential in the combination of ground and airborne techniques that are used in MMS. Vehicles provide mobility and are fitted with the same navigation devices and mapping sensors as airborne platforms.

To explore this potential, David Barber and Jon Mills assessed the accuracy, completeness and consistency of a test dataset comparing a sample digital terrain model (DTM) against datasets from an independent control survey and ALS. They also focused on the potential advantages and disadvantages of the use of MMS in the coastal environment, in comparison to existing techniques, and on the real benefits MMS might have for the assessment of risk to property in and around the coastal zone.

How did they do it?

The team selected the coastal site of Filey Bay, just south of the town of Scarborough, North Yorkshire, as their case study. The geology of the bay includes steep cliffs with a long history of erosion. With help from 3D Laser Mapping of Nottingham, they mounted a Reigl ALS on the roof of a 4x4 vehicle. By using a locally operated GPS base station to provide a differential correction, they could determine accurately the location of the vehicle as it drove along the shore.

The MMS survey took place at low tide on 26 June 2006 and comparative data was collected from two test sites within the bay area. At each site, around 100 survey points were collected on the cliff face and along the top and bottom of the cliff area, on areas of exposed earth, so that they could be compared to data from a bare earth ground surface generated by the MMS survey. The MMS data was also compared with airborne lidar data collected eight weeks earlier.

The findings

The resulting survey, *Rapid Mapping Techniques in Coastal Environments: monitoring the coastline*, shows that ground-based systems may be severely limited by problems of coverage and access. At the test site, not all areas on the cliff are visible from a vehicle driving along the beach, and marking-out of cliff tops in such circumstances is not straightforward using MMS data alone. However, as David Barber points out, "in applications requiring a number of accurate beach profiles and cliff-top locations within a



A fence on an eroded cliff top

single tide, such a system would be invaluable". While there are obvious benefits to ground-based systems, the researchers acknowledge that their generic use may be restricted by access to certain beach types. While accessing the beach at Filey Bay was straightforward and the beach surface was firm enough to allow for easy driving, other beaches might have coastal defences or coastal management schemes in place that would obstruct a vehicle. Equally, other beaches could have an unsuitable driving surface, such as loose rocks.

Despite these problems, David Barber and Jon Mills successfully demonstrated that laser-scanning data can be collected from a ground-based moving platform in a coastal environment. They compared lidar data, collected with a ground-based MMS, with survey data and an airborne lidar dataset. While further calibration of the system might be required, the collection of data in this way shows potential for certain applications – in particular for the collection of detailed beach-surface information and the profiling of lower cliffs that are the most vulnerable to wave action.

'While an MMS is unable to provide a complete picture of coastal change, it clearly complements the airborne data which may be collected at a lower spatial resolution and less often,' says the report.

This research proposes that one of the greatest benefits of MMS is the simplicity with which it can be deployed. It could also be of particular use in scientific studies, where data with a high temporal resolution is required to gain a better understanding of coastal processes and mechanisms.

In a clear final message, the researchers comment that, 'if coastal engineers, developers and planners can be given a more detailed view of coastal changes, it will lead to an improved understanding of the mechanisms and processes involved.'

This would help to prioritise coastal defence schemes and improve decision making, which in turn would give certainty to land and property owners living along the coastline.

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Future Flooding and Coastal Erosion Risks
by C Thorne & E Evans,
priced at £27.50, available
from www.ricsbooks.com



Rapid Mapping Techniques in Coastal Environments: monitoring the coastline
can be downloaded from
www.rics.org/research

For RICS's position on the draft Marine Bill, enter the words 'draft Marine Bill' in the search facility on www.rics.org

Knowing it's the real deal

Ellen Epstein FRICS. Appraisers/valuers are continually confronted with the issue of authenticity. How does an appraiser deal with this integral value factor and what exactly, is the appraiser's responsibility in this issue?

What is it and what is it worth are two of the most common questions asked of appraisers by owners of personal property. The appraiser's response embraces an extraordinary concept and one particularly difficult to explain, especially to the client: it is, simply, that appraisers do value an object – any object – without actually authenticating it.

How is this possible? Authenticity, of course, is THE primary and most inherent value characteristic of any object. An object's value is defined by its authenticity. Yet, a professional appraiser can competently value an object and simultaneously maintain that the appraisal is not an authentication. The appraiser's responsibility for the authentication of the object, and consequently for its value, however, is not voided by this assertion.

The obligation towards the authentication process is a vital component of the *due diligence* and *standard of care* now applicable to and required of professional appraisers. Educated 'guesses', instinct, or statements of assumption are not acceptable in today's professional appraisal practice and without any question, it is certainly not acceptable for any appraiser to rely on the mysterious phrase 'readily apparent identity'. Due diligence regarding the appraiser's responsibility for object authenticity has a well accepted path today.

The path begins with the competency issue as discussed in *The Uniform Standards of Professional Appraisal Practice* (USPAP): "The COMPETENCY RULE requires an appraiser to have both the knowledge and the experience required to perform a specific appraisal service competently". This is a critical factor, which is all too often minimized and its misuse can create mayhem in valuation.

It might be relatively simple for an antiques and decorative art appraiser to know if he or she can 'authenticate' sterling silver, silver plate, etc., but does that same appraiser have the expertise to recognize added elements or marks, alterations or other value factors that might significantly add or detract from the object? A fine art appraiser can usually distinguish a photo offset reproduction from an original graphic, but can that appraiser recognize an authentic signature? The expertise required to, at least be able to recognize whether the object is a valuable piece of Georgian sterling silver, for example, or a rare Meissen piece, is an awesome

responsibility which must be addressed by the responsible appraiser. It may not be possible for an appraiser to confidently 'authenticate' the object without an expert's consultation, but it is the appraiser's obligation to *due diligence* and the *standard of care* to know whether an object requires expertise additional to one's own.

It is also incumbent upon the professional appraiser to be familiar with any specific authenticity issues relevant to the art, antique, jewelry, memorabilia, etc. object being considered. For example, a prudent appraiser must be aware of the current state of the Dali market, the 'Pollock factor', the plethora of pre-Columbian fakes, enhanced gemstones or fabricated modern baseball memorabilia. Any crucial authenticity issue impacting his or her field of expertise should be known to the appraiser and should immediately be recognized as a 'red flag'. This genre of information can only be gathered through consistent, constant and continuing education, which is readily available by reading art and antique journals, other magazines and newspapers, attending seminars, lectures, museum and gallery exhibitions, university and college offerings, professional meetings, professional organizations, peer and networking groups, trade shows, etc. Membership in professional societies like RICS or the ASA, which stress and even require continuing professional education, has become a great asset.

Authentication and attribution are seriously contentious and dramatic issues in the marketplace today. Litigation surrounding these issues is commonplace and formidable.

There is a commonly held belief that the only person who can establish authenticity is the person who created it. However, in most cases, this is not a viable condition.

In France and a few other European countries, the doctrine of *droit morale* is given to the artist and passed to an heir or designee after his death for purposes of authentication of a work of art. (As an aside, although authentication by the person who holds the *droit morale* carries substantial weight in the art market, legally it is not conclusive proof.) Clients quite often offer documents such as letters of authenticity from various 'experts', holders of the *droit morale*, or various other types of certificates of authenticity in support of the legitimacy of the

object being valued. The appraiser must be knowledgeable enough to understand the extent of influence that should be or should not be given to these documents. Concern about the authenticity of the documents themselves is another consideration which has lately become of more interest. Or, particularly with objects of high value, the appraiser might find it necessary to recommend that the client pursue appropriate authentication before the valuation. The appraisal of a significant object for charitable donation or estate tax purposes can hardly be competently completed without substantial evidence of authenticity. All of this does enter into the *due diligence* and *standard of care* now expected of the professional appraiser.

Today, the authentication process customarily includes various considerations: expert opinions and connoisseurship (including any catalogue raisonné support, authentication committee or board reports or lack of), any other documentation, provenance, history (exhibition and publication), extent or lack of any restoration or conservation and scientific evidence. No single factor usually establishes authenticity. It is the professional appraiser's obligation to be comfortable and competent in assessing and applying all of the elements that are available for consideration of an object during the valuation process. *Due diligence* also requires that the appraiser have the expertise to determine if the available information is adequate for the apposite valuation and to advise the client to obtain the necessary information if it is not. Although this advice may not be greeted with enthusiasm by the client, it should be provided.

The appraiser's basic responsibility and the requirement for an accepted level of the *standard of care* is to have the proper expertise and experience relevant to the object accepted for valuation. The appraiser must also have knowledge of issues related to the authenticity of the object and competence in evaluating all the available evidence. This includes not only the appraiser's own experience but also his or her ability to properly perform requisite research. It is also essential to recognize when to propose that the client secure additional important information. Following the path described above the appraiser has executed *due diligence*. Full disclosure of all of the steps taken on this path should be included in the appraisal narrative, along with a statement indicating that the appraisal is not an authentication.

Ellen Epstein FRICS

Appraiser

AARC GROUP

Appraisers for the Fine & Decorative Arts

A fine art appraiser can usually distinguish a photo offset reproduction from an original graphic, but can that appraiser recognise an authentic signature?



© Jo Ann Snover

Is it a fake? Knowledge of object authentication is key

An earlier version of this article was published in the January/February 2008 issue of RICS Arts Surveyor

Almost seeing double

A huge growth in the international art market led to sales almost doubling in just four years, pushing it to its highest ever recorded annual total of €143.3bn (£32.3bn)

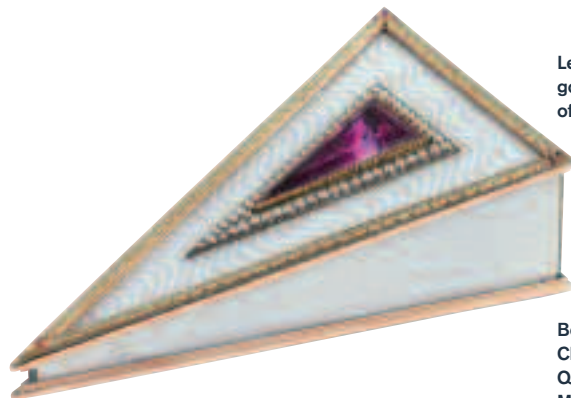
According to a new report commissioned by the European Fine Art Foundation (TEFAF) from 2002 and 2006 the value of sales in the world art market soared by 95% while the number of transactions increased by almost a quarter. The rate of increase intensified towards the end of this period with turnover going up by half in a single year in 2005-2006 as demand for contemporary art rose and buyers in the emerging economies of China, Russia and India flexed their financial muscles.

The report, *The International Art Market, A Survey of Europe in a Global Context*, has been prepared by Dr Clare McAndrew, a cultural economist specialising in the fine and decorative art market and editor of the financial magazine *Wealth*.

It is based on an extensive international survey of dealers and information from auction houses and databases. It is the latest in a series of important annual studies commissioned by TEFAF but is said to be the first detailed look at the development of the international art market since 2002.

The key findings of the survey include:

- the value of art market sales increased by 95% from €22.2bn in 2002 to a record €43.3bn in 2006
- the number of transactions increased by 24% from €25m to €32.1m during the same period
- 2005-2006 was a boom year for the art market with sales increasing by 50.3%
- a huge increase in sales in China has turned it into the fourth largest global art market with a 5% share by value
- Europe's share of the art market dropped by 6.3% while the US increased by 2.4%
- the UK remains the largest market in the European Union with 60% of the European market and a 27% global share
- contemporary art has seen the highest growth rates over the last five years and, although the US has the largest share of this sector with 47%, China now equals the British proportion of 20%
- the spread of wealth resulting from globalization may help protect the international market from the effects of a recession
- although auction houses have often dominated the headlines, dealers have a 52% share of global sales and art fairs are emerging as an increasingly important method of selling.



Left: An Imperial Russian gem-set gold and enamel bellpush by Fabergé offered for sale by Wartski of London



Below: *Panda in Beetle*, 2007 by the Chinese contemporary artist Zhang Qikai offered for sale at TEFAF by Marlborough Galerie of Zurich



Above: Diptych: *The Virgin and Child flanked by Angels and the Crucifixion* made in France 1300-1325 offered for sale at TEFAF by Blumka Gallery of New York

Left: *Saint Sebastian Bound for Martyrdom* by Sir Anthony Van Dyck painted c1622-3. Recently rediscovered and offered for sale by the Weiss Gallery of London

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