The Clay Research Group

RESEARCH AREAS

Climate Change ◆ Data Analysis ◆ Electrical Resistivity Tomography
Time Domain Reflectometry ◆ BioSciences ◆ Ground Movement
Soil Testing Techniques ◆ Telemetry ◆ Numerical Modelling
Ground Remediation Techniques ◆ Risk Analysis
Mapping ◆ Software Analysis Tools

The Clay Research Group

September 2012

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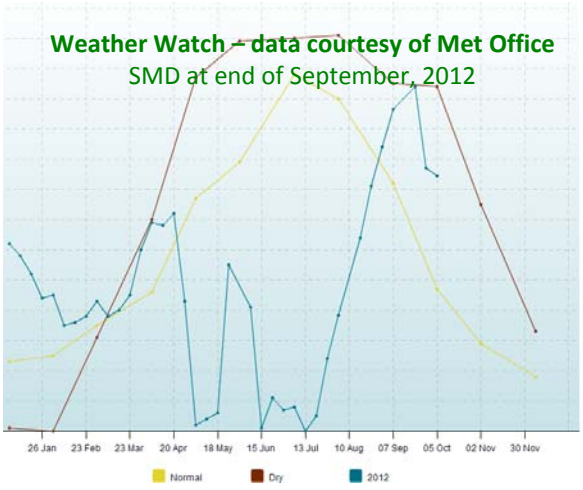
Issue 89, September, 2012



THE CLAY RESEARCH GROUP
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This Edition

The summer of 2012 has apparently been the wettest and coldest for 100 years, and the dullest since records began, following on from one of the driest year starts. The SMD plot below is a mirror image of the 'normal' plot.

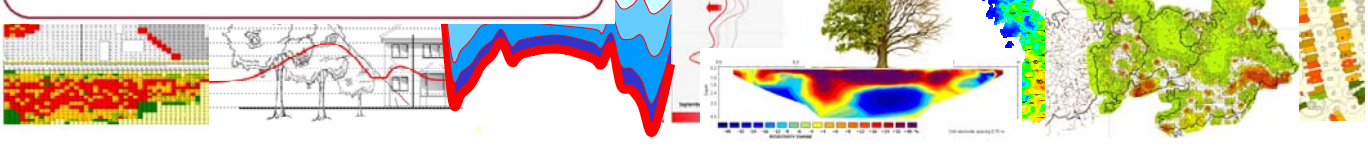
A recent article by Stefan Rahmstorf of the Postdam Institute for Climate Impact outlines his view of what 2013 holds taking into consideration the influence of El Nino and La Nina. See New Scientist, 'Opinion', September 2012.

Tony Boobier, EMEA Insurance Head of IBM Business Analytics and a well known figure in the world of both insurance and subsidence provides an overview of what the CRG offer. Tony outlines the value of analytics and suggests that some of the methods used by the CRG are transferable to other perils.

This month we publish the results from a broad analysis of where costs lie geographically, and provide some idea of the risk posed by area in terms of numbers. How does Leeds compare with Manchester, Birmingham or London?

The Subsidence Forum have arranged a training day on the 17th October, 2012, at the BRE. To register, visit their web site at www.subsidenceforum.org.uk.

Amongst the speakers are Neil Hipps who will be talking about "Tree Physiology, Pruning and Subsidence", Richard Rollit will be discussing Indemnity and Keith Gaston will look at the implications from Berent. Neil Crawford and Owen Edwards will show some interesting case studies. Hot topics, and well worth attending.



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Tree Pruning Research Project

Project Update – 'Hortlink II'

Jim Smith hosted the latest meeting to move the 'Hortlink II' project along. Chaired by Neil Hipps, the project plan outlined the proposed methodology and funding requirements.

The initial study will determine the feasibility of using existing claims data to understand the impact of tree pruning on water uptake. It is an extension of Horticulture Link 212, undertaken by Dr Hipps whilst at East Malling Research.

The proposal is to identify 10 cases for this pilot study. OCA have agreed to allow access to their data.

"The OCA data will enable 'hotspots' for tree related subsidence to be identified and agreed. Further data will be made available from other project partners. The London Tree Officers Association will co-ordinate requests to the relevant boroughs which have previously been identified as hotspots and supply relevant specific case data. Additional or complimentary data will be supplied by Geo-Serv Ltd. which includes cases where level monitoring had been used to quantify foundation movement and some records have been kept of tree management re. application of pruning treatments."

Funding is obviously an important issue and we understand that the Forestry Commission have agreed to contribute half towards the total estimated cost of £12,000.

After the meeting, Neil Curling made representations to the Property Claims Forum at the offices of the ABI.

Apparently, the ABI were in favour of providing partial funding and particularly as it had the support of members in attendance representing insurance companies.

Neil Curling is putting together a report with the help of colleagues on the project committee to present to the ABI sometime towards the end of November, 2012.

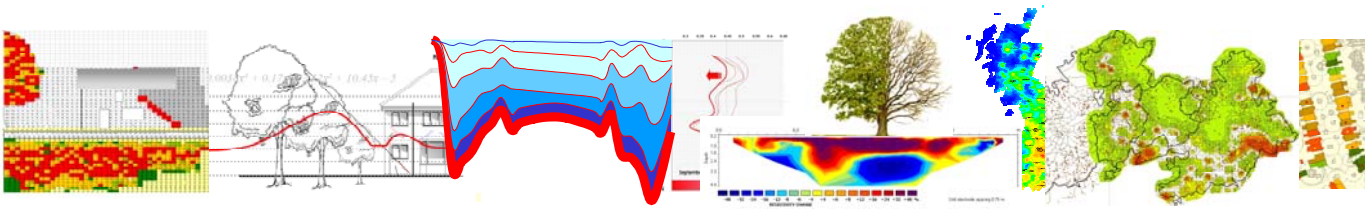
Open Access Research

The Government have plans to make access to research papers much easier. At the moment, there are two options. Subscribe to the Journals, or pay a fee to download a particular paper of interest. The cost of downloading a paper is usually around £20, but can be much higher. The proposal allows access to publicity funded research in Britain from 30 Universities.

The CRG Web Site by Numbers

There were a record 25,021 'hits' on the CRG web site in June, 2012. 2,882 of these were on the 14th of that month, which was a Thursday.

There were 1,488 visits from around the world, with an average of 50 per day, peaking at 70 on the 6th June.



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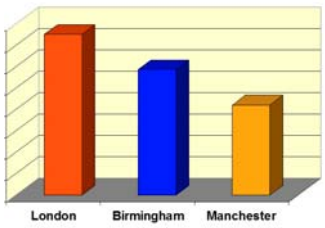
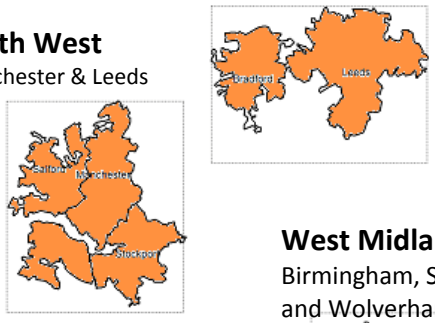


Risk by City

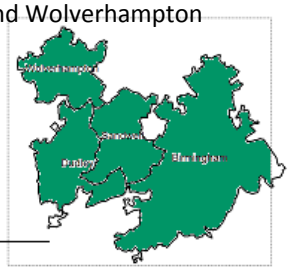
Count of Claim and by Cost Comparison

Parts of London often feature in the newsletter, due to the high claim count and the combination of a highly populated area on outcropping clay, but how do the other major cities compare? The results of a brief analysis are shown below. London is shown red on the bar graph, Leeds and Manchester, orange, and the West Midlands (Birmingham, Wolverhampton, Dudley and Sandwell), green.

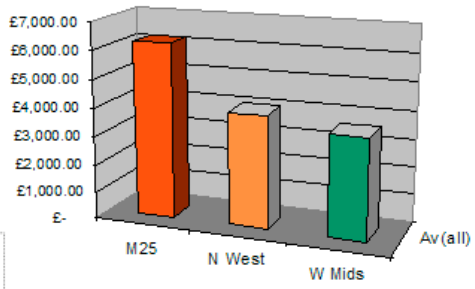
North West
Manchester & Leeds

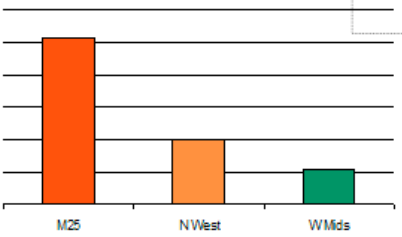


West Midlands
Birmingham, Sandwell and Wolverhampton

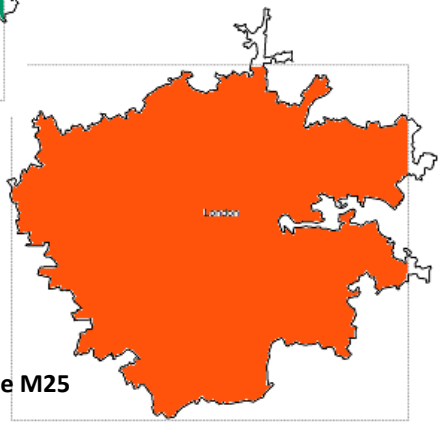


COST



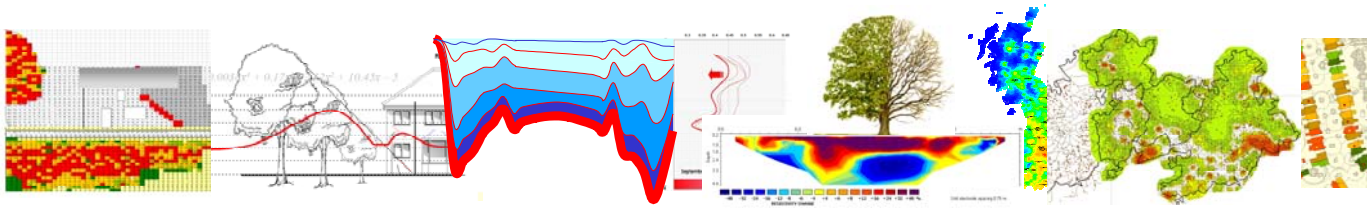


COUNT



London
Out to the M25

In terms of count, we can see that London is 5 times riskier than the west Midlands, and that the West Midlands are just over half the risk of the North West. In terms of cost the average claim cost (valid and repudiated claims), is higher in London as we would expect. Claims in this area cost around twice as much as claims elsewhere. The majority of the difference lies in the cost of valid claims for root induced clay shrinkage. There are more valid claims in London, and of a more technical nature, even ignoring the demographics and property costs. Whereas drainage claims produce, by and large, localised damage and the resolution is 'fix drain, repair house', root induced clay shrinkage claims can take some time to resolve.



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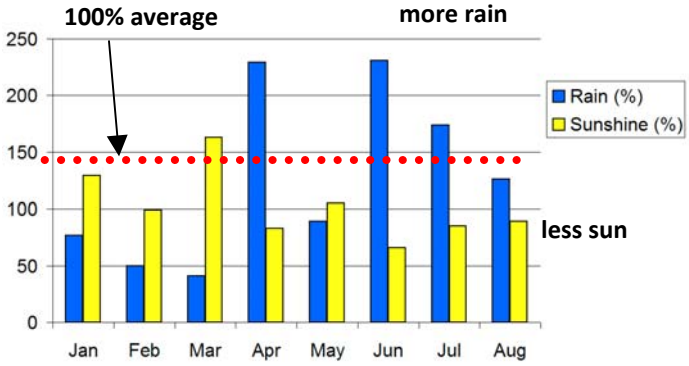
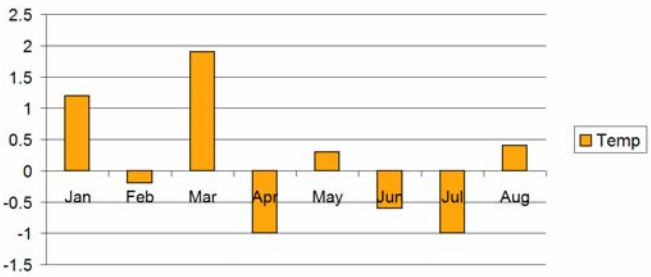
Met Office Anomaly Data

Below are the temperature and sunshine data for 2012 expressed as difference from 1981 - 2010 averages. June, July and August have been wetter than the average (red dotted line), with less than the average hours of sunshine.



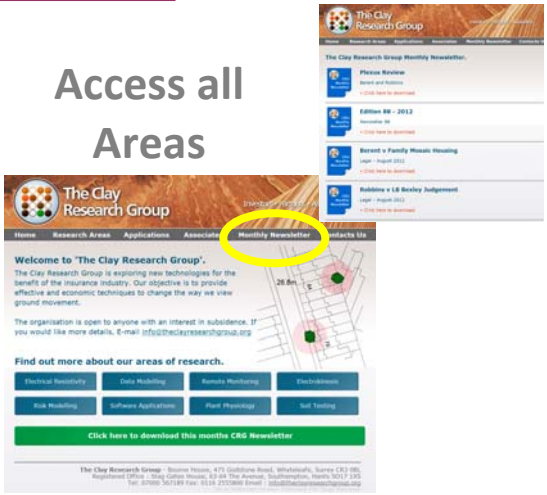
Expressed in a slightly different way, the temperature data (below) reveals that June and July were cooler than the 30 year average, with August warming by less than half a degree.



London Trees

It is estimated that there are around 6 million trees in the London Boroughs, providing around 20% of canopy cover by total geographical area. The increase proposed by the Mayor adds 5% extra canopy cover which equates to around 2 million extra trees planted.

Access all Areas



The CRG web site provides access to the most recent uploaded document by pressing the green bar. To download older newsletters or general interest articles by others, select 'Monthly Newsletter' as shown above, and view the index.

Recent cases of Berent and Robbins have been included, as well as a review of the legal position as seen by Plexus Law. The Subsidence Forum Training Day programme has also been uploaded.

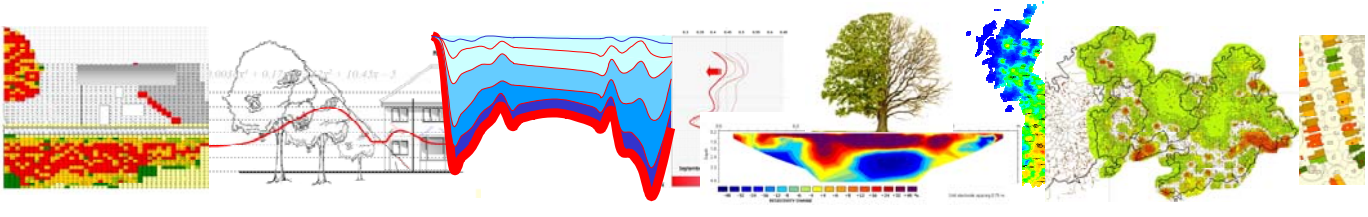
In future we will be adding general interest documents from a variety of sources, including legal reviews and scientific papers.

Frequency –v- Count

If you are an underwriter, you will probably be interested in frequency. How many premiums do I receive to meet the claims that arise? Is 1:1,000 a high risk, or about average?

Adjusting practices and claims handlers will have a different view, reflecting operation needs. They want to know how many claims they are going to receive in a particular area if there is a surge. They are interested in count.

London isn't orders of magnitude different from most other cities in terms of frequency, but the sheer number of claims can be overwhelming.



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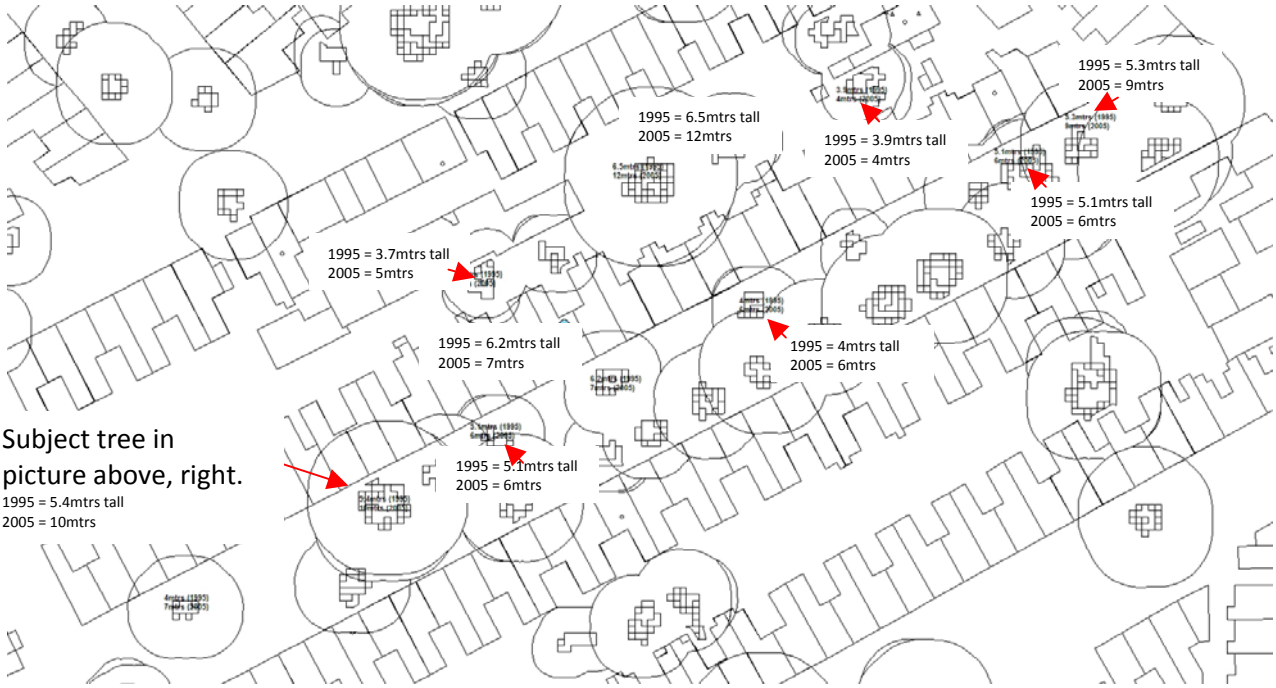
Tree Growth over Time

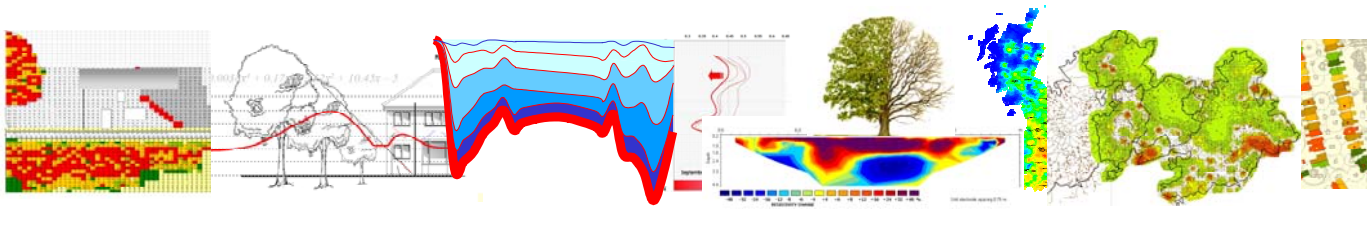
Our recent study of the Berent and Robbins claims included an assessment of tree heights over time. Unfortunately, the study can't distinguish between pruned and unpruned trees, but we have selected a few examples from recent claims where we have an arborists report of the current situation.

The plan below records the height of trees in 1995 and again in 2005, ten years later. How much growth has taken place in the intervening period? Have the trees already been cut back in this 'hot spot' as part of a pruning regime? As we would expect, the rate varies but over ten years the figures range from around 100mm up to 600mm p.a. in the case of the taller tree to the rear of the block.

Right we see the Silver Birch (using Street View) that is indicated on the plan below. We understand that this tree is associated with a claim for subsidence damage.

Silver Birch, 5.4mtrs tall in 1995, 10mtrs in 2005 and 10mtrs in 2011, confirmed by arborists site visit.





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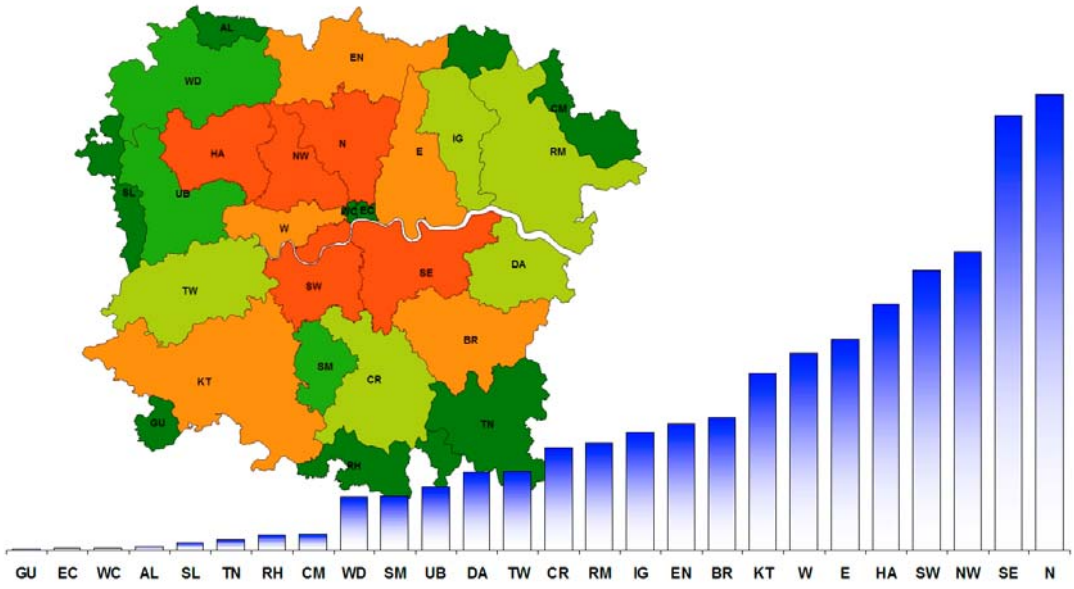
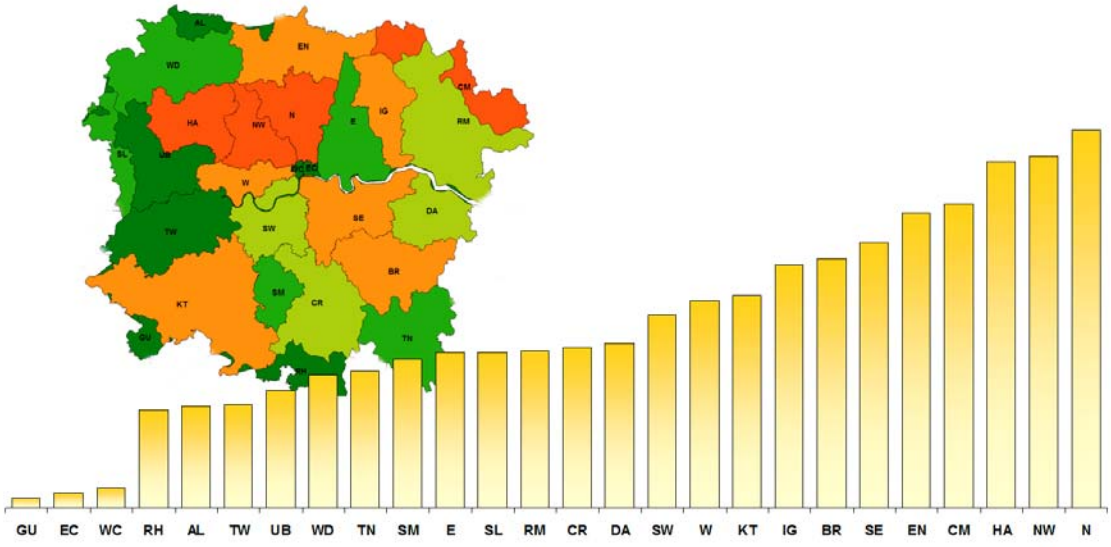
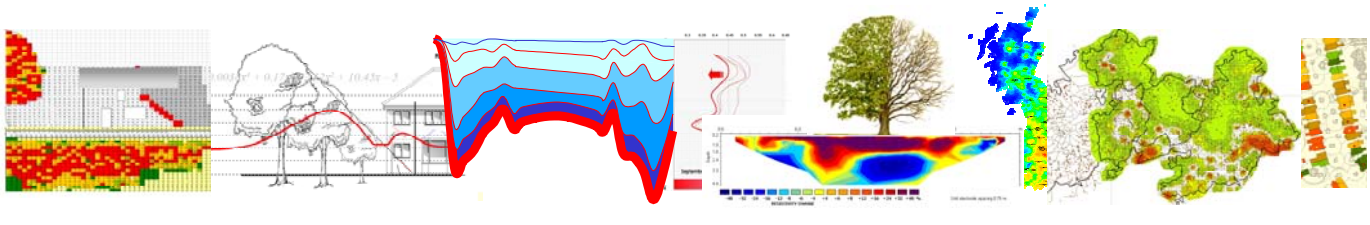


Rank Order of Postcode Areas by Claim Count



Rank Order of Postcode Areas by Claim Frequency



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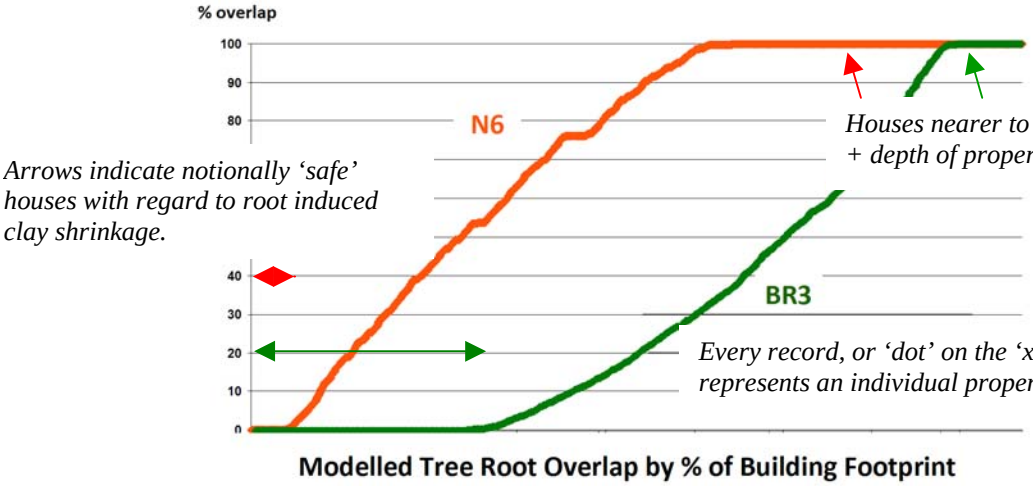
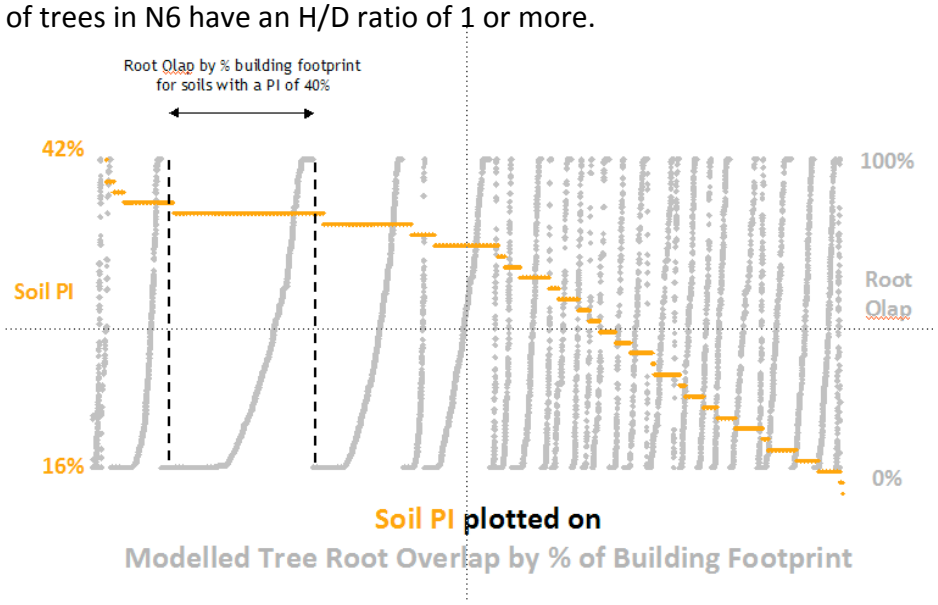
Relationship between Modelled Root Overlap and Soil Shrink Swell Potential

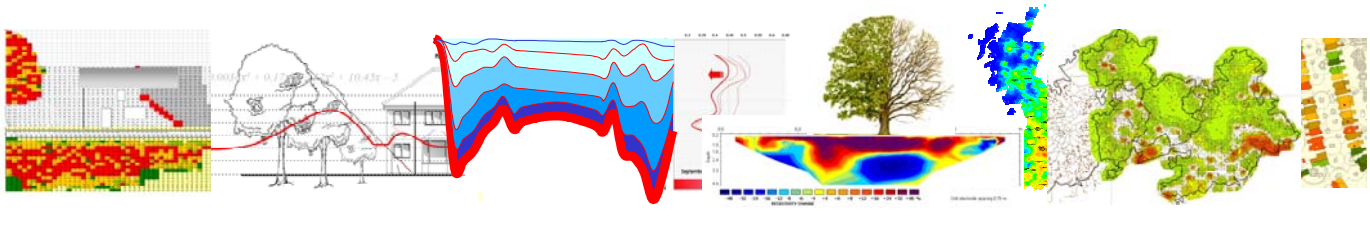
A method of differentiating the risk between Boroughs, individual roads or houses.



The term 'modelled root zone' might be best regarded as a function of H/D, ignoring tree species, in which case around 30% of the properties in BR3 have no 'modelled' roots beneath their foundations. Less than 10% have 100% cover. In contrast, N6 has far more trees closer to buildings, and fewer that might be regarded as safe with regard to the distance:height ratio. Around 40% of trees in N6 have an H/D ratio of 1 or more.



Of the modelled tree root zones, not all are on clay soil. An additional refinement is to categorise the root zones by soil shrink/swell potential. There is a fairly consistent relationship between the modelled root overlap zone by soil P.I. in the example above. In this sample over 60% of the root zones are on clay with a P.I. greater than 30%.



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THE WORLD of ANALYTICS

An article by Tony Boobier - EMEA Insurance Head of IBM Business Analytics

It seems extraordinary that the first edition of the newsletter came out in December 2005, and to reflect how many changes have taken place in the use of analytics since that time. IBM have invested $12bn in analytic solutions since then, many of which finding their way into the insurance industry.

Insurers are increasingly using analytics in three specific areas

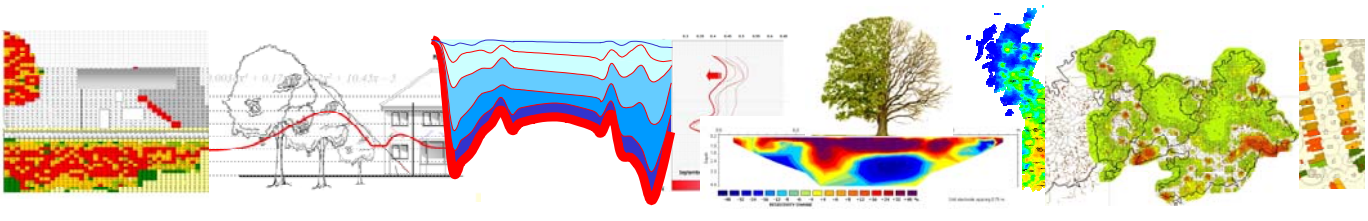
1. Operational effectiveness, ie in the Office of Finance, fraud analytics and supply chain management
2. Customer Insight – identifying retention and upsell / cross sell opportunity
3. Risk analytics, where in Europe the agenda is increasingly (although not exclusively) dominated by Solvency II

In 2005 the North American insurance market was arguable 5-7 years ahead of Western Europe in its thinking about the use of technology. Now the gap is 12 months, maybe less, and in some topics the UK are seen as thought leaders.

Our knowledge of the use and implementation of analytics has also grown over that period. The 2011 report [(1)] called 'Analytics – the Widening Divide' not only discussed how organisations adopting the use of analytics can obtain competitive advantage, but also recognises that there are different ways in which analytics can be incorporated into an organisation.

Put simply, these two ways are :

- **Enterprise adoption**: The organisation recognises the value of analytics in their business and uses information not only to support individual business decisions, but also to as a key enabler of delivering strategy objectives. In this model, senior executives come to expect that all decisions are informed by analytical insight. Research indicates that businesses adopting this approach are more focussed on the timeliness and relevance of the data than on the accuracy.
- **Specialised Path**: Organisations which adopt analytics to provide solutions for specific business issues, using bespoke tooling. Despite their strength as a 'point solution', these tools are not readily usable across the wider enterprise because of their specialist nature, and their scaleability is often affected by their positioning in organisation silos where executive sponsorship is at best only at departmental level.



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The World of Analytics … *continued*

Analytics is also rising in profile as well, one recent notable example being the creation of the new role of Chief Analytics Officer within a major broker, and elsewhere the appointment of a 'Chief Scientist' within a multinational insurer. Analytics are increasingly being used to create new business models, ie telematics allowing policyholders not only to 'pay as they go' but also pay 'how they go', with premium pricing dependent as much on when drive as how you drive.

Subsidence remains a major issue in the insurance market and albeit not as expensive as in past years, industry costs are probably still in excess of £300m a year. This is a significant amount short of the potential £1.0 billion 'event year' predicted a decade ago, and well short of the annual cost of UK flooding and fraud. Put into context, the cost to UK insurance industry of complying with Solvency II is estimated by FSA as in excess of £2.0Bn. [(2)]

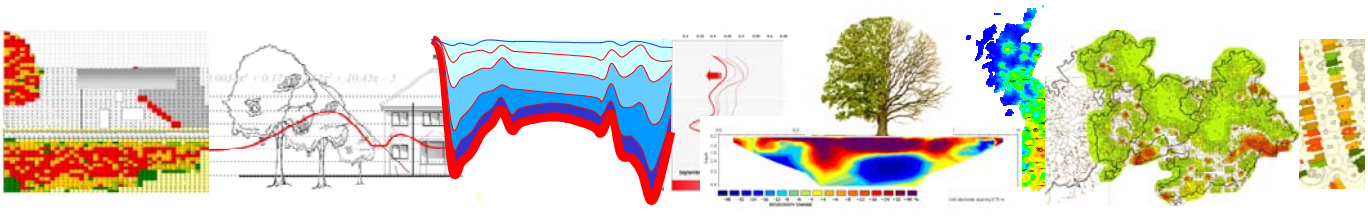
Ironically, much of the work done by the Clay Research Group is transferable. It comprises remote monitoring, complex algorithms and spatial temporal analytics – in one of the most complex operational environments possible. Over the years it has become clearer that the impact of trees on property cannot be determined with absolute certainty but only that the probability of certain outcomes can be identified, but that is a perfectly valid stance, in that insurance has never been about certainty but rather about probability, in the same way that the behaviour of a teenage driver in a sports car cannot be predicted with absolute certainty.

Whilst the subsidence market has stagnated and perhaps even has reduced, the wider analytics opportunity enjoys exponential growth and will continue to rapidly evolve for the foreseeable future. Should CRG think about adopting a broader analytical stance beyond the purely subsidence agenda?

Tony Boobier
EMEA Insurance Head of IBM Business Analytics
boobier@uk.ibm.com

References:

1. *Source: The New Intelligent Enterprise a joint MIT Sloan Management Review and IBM Institute of Business Value analytics research partnership. Copyright © Massachusetts Institute of Technology 2011.*
2. *Insurance Day 25th Nov 2011*



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Dry Soil = More Rainfall?

Christopher M. Taylor, Richard A. M. de Jeu, Françoise Guichard, Phil P. Harris, Wouter A. Dorigo.
Afternoon Rain more likely over Drier Soils.
Nature, 2012

A team of weather experts have published a paper in the prestigious journal, Nature, concluding that the chances of precipitation are higher over dry ground, linking soil moisture to rainfall, in what seems a counter-intuitive finding.

The experts include The Centre for Ecology and Hydrology (Wallingford, UK), the VU University Amsterdam, the Centre of Meteorology CNRM in Toulouse, and the Vienna University of Technology.

One of the authors, Wouter Dorigo, explains "It's tempting to assume that moist soils lead to higher evaporation, which in turn stimulates more precipitation," says Wouter Dorigo (Vienna University of Technology), one of the authors of the study. "This would imply that there is a positive feedback loop: moist soils lead to even more rain, whereas dry regions tend to remain dry." But observations suggest otherwise: "We have analysed data from different satellites measuring soil moisture and precipitation all over the globe, with a resolution of 50 to 100 kilometres. These data show that convective precipitation is more likely over drier soils"

The new data contradicts established computer models. A conclusive explanation for this effect has yet to be found. "The air over dry soils heats up more easily. This could lead to a more intense vertical draft," Dorigo suspects. However, this cannot yet be described at a sufficient level of detail with today's computer simulations.

Rainfall = Hot Days?

B. Mueller, S. I. Seneviratne.
Hot days induced by precipitation deficits at the global scale.
Proceedings of the National Academy of Sciences, 2012

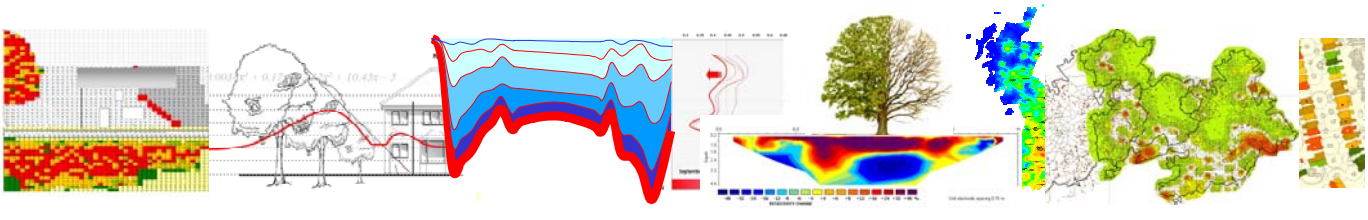
A study by ETH Zurich shows that precipitation deficits increase the probability of hot days in many regions of the world. They suggest that the results will help to better assess heat risks and followed a study linking soil moisture and extreme heat.

The authors say “The Texan record summer was one example of what climate scientists have also been able to demonstrate in other regions in recent years: if there is a precipitation deficit in the spring, the probability of heatwaves in the summer increases.”

“The water content of the soil is not only a decisive factor in ensuring that plants thrive, but it also influences the energy exchange with the atmosphere.”

“If the earth is saturated with water, moisture evaporates from the ground, thus stopping the atmosphere from heating up too quickly. However, once the ground has dried out, solar radiation heats up the air unrestrained.”

Their statistical calculations show that precipitation deficits and dry soil increase the temperatures in many regions of the world more strongly and quickly.



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Cost analysis of stratospheric albedo modification delivery systems.

McClellan, J. et al August 2012
Environmental Research Letters

The authors undertake a cost analysis of transporting materials into the stratosphere to reduce the amount of sunlight hitting Earth with the objective of reducing the effects of climate change has shown that they are both feasible and affordable

Fortunately, the authors include a caution that reducing incident sunlight does nothing at all to reduce greenhouse gas concentrations in the atmosphere, nor the resulting increase in the acid content of the oceans. They note that other research has shown that the effects of solar radiation management are not uniform, and would cause different temperature and precipitation changes in different countries.

The press release in Science Daily says "Although completely theoretical at this point in time, a large gas pipe, rising to 20 km in the sky and suspended by helium-filled floating platforms, would offer the lowest recurring cost-per-kilogram of particles delivered but the costs of research into the materials required, the development of the pipe and the testing to ensure safety, would be high; the whole system carries a large uncertainty.

2013 - El Nino, or La Nina?

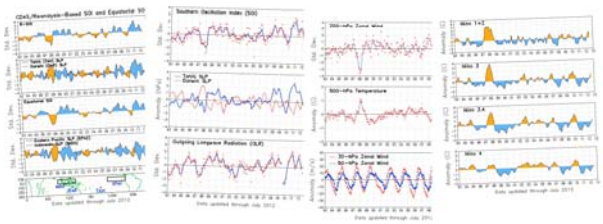
Summary of article by Stefan Rahmstorf
"opinion", New Scientist, September 2012.

Rahmstorf puts together a simple story supporting the case for global warming and explains that "some observers (US National Oceanic and Atmospheric Administration - NOAA) have predicted that this will lead to record-breaking global temperatures next year."

The 'this' he refers to, is El Nino. After a few years being dominated by La Nina, the warmer cycle is due to return.

He relates that, for the past 30 years global temperature has shown a linear warming trend of 0.16^{o}C per decade.

Apparently, 2005 and 2010 were warmer due to the influence of El Nino, whereas 2008 and 2011 were below the trend line due to La Nina. Even though 2011 was cooler, it was still a warmer La Nina than usual – in fact, it was the hottest La Nina on record.



Various measures of the eastern equatorial Pacific Ocean that drive the El Nino, La Nina cycles.

El Nino and La Nina are determined by the eastern temperature in the equatorial Pacific, measured by a series of buoys. 2013 is likely to be warmer according to NOAA.