

Fisher Information Theory

Last time I wrote it was to discuss the application of information theory to the creation of practical tools for defining sustainable development. Such tools are sorely needed by a global community that faces an increasing number of interrelated environmental and social challenges that transcend national, regional and even continental boundaries. Managing or solving these challenges is severely hampered by information interflow and co-ordination between a multiplicity of disciplines that is, at best, primitive.

Fisher Information (FI) theory, through its capacity to incorporate metrics from both inside and outside the environmental domain, provides ways to measure and define the stability of dynamic complex systems and offers a way of solving issues involving information interflow across disciplines. Using FI we will be able reliably to draw conclusions as to whether or not a complex system such as global climate is in a stable dynamic state. We will also be able to select reliable variable(s) to support these conclusions.

A Chinese military strategist recently stated that events of 20th March 2003 in Iraq forever changed world history because the overland transportation “nexus connecting Europe, Africa and Asia has now been secured.” I was intrigued and puzzled by a senior strategist focusing on secure transportation rather than on oil or social change. I realised subsequently that the five permanent UN Security Council members have quietly secured “New Silk Road” mega-project transportation and development corridors. The USA and UK are in Iraq (nexus), Russia commands the northern routes, China anchors the Far East and France (EU) anchors the West.

Is this good news for Eurasia, or bad? The world watches as China races against time to achieve developed-nation status before its natural resources are damaged beyond repair. Imagine this situation magnified tenfold as development follows the proposed transportation “super corridor” across the vast expanse of inner Asia. How will the global community manage the multiplicity of complex, long-term, interrelated global challenges that will arise from this project? For those in the Americas who may think this an abstract problem, as it lies half a world away, consider this. It is reported that 40% of certain air pollutants present on the West Coast of America have their origin in China. The Europeans have a similar situation with pollutants originating in the US. The wind does not recognise national boundaries or oceans as barriers.

FI-based approaches will be particularly suitable for managing mega-projects such as the “New Silk Road” by opening up the possibility of real-time, dynamic integration of information interflow from interlocking environmental, economic and political systems. If the potential of FI can be realised, professionals in the global community concerned with carrying out sustainable development may finally have at their disposal a reliable management tool for use over coming years. Geomatics professionals need to be aware of the simple fact that we will be the source of the environmental metrics essential to FI-based approaches, and be ready to participate in the many new market opportunities that will result.