

IPENZ ENGINEERING UPDATE June 2011



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Samplings from this Issue

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- Economics of a hydrogen bus transportation system: Case study using an after tax analysis model.

➤ Special Focus : Flood risk management

Management/Leadership/Strategic Planning/Recruitment/Training and Development/Project Management/Corporate Responsibility

√IPENZ 47/01 The wise leader.

Nonaka, I. and Takeuchi, H. Harvard Business Review, Volume 89, Issue 5 (May 2011) Pages 58-67. In an era of increasing discontinuity, wise leadership has nearly vanished. Many leaders find it difficult to reinvent their corporations rapidly enough to cope with new technologies, demographic shifts, and consumption trends. They can't develop truly global organizations that operate effortlessly across borders. And they find it tough to ensure that their people adhere to values and ethics. The authors assert that leaders must acquire practical wisdom, or what Aristotle called phronesis: experiential knowledge that enables people to make ethically sound judgments. Wise leaders demonstrate six abilities: (1) They make decisions on the basis of what is good for the organization and for society. (2) They quickly grasp the essence of a situation and fathom the nature and meaning of people, things, and events. (3) They provide contexts in which executives and employees can interact to create new meaning. (4) They employ metaphors and stories to convert their experience into tacit knowledge that others can use. (5) They exert political power to bring people together and spur them to act. (6) They use apprenticeship and mentoring to cultivate practical wisdom in others.

√IPENZ 47/02 Safety management: A personal development strategy.

Smith, T. A. Professional Safety, Volume 56, Issue 3 (March 2011) Pages 58-68. The article focuses on the application of systems thinking by safety, health, and environment (SH&E) professionals to improve the quality of industrial safety management. It says that companies considered behaviorism to prevent employee accidents in 1980s. It discusses the management philosophy of continual improvement. Furthermore, the adoption of plan, do, study and act (PDSA) cycle and profound knowledge advocated by W.E. Deming help enhance the safety efforts on the workplace.



√IPENZ 47/03 The social nature of engineering and its implications for risk taking.

Ross, A. and Athanassoulis, N. Science and Engineering Ethics, Volume 16, Issue 1 (March 2010) Pages 147-168.

√IPENZ 47/04 Infusing creativity into crisis management: An essential approach today.

Pearson, C. M. and Sommer, S. A. Organizational Dynamics, Volume 40, Issue 1 (January/March 2011) Pages 27-33.

√IPENZ 47/05 Extreme productivity.

Pozen, R. C. Harvard Business Review, Volume 89, Issue 5 (May 2011) Pages 127-131. A veteran top executive at two giant mutual fund companies, the author has also been an attorney, a government official, a law school professor, and a business school professor-sometimes simultaneously. Over the years, he has devised a number of principles and practices to maximize his personal productivity without sacrificing his health or family life. In this article he presents six of them.

√IPENZ 47/06 **Building conservation philosophy for masonry repair: Part 1 - "Ethics".**
Forster, A. M. Structural Survey, Volume 28, Issue 2 (2010) Page 91.

√IPENZ 47/07 **Carbon capture and storage as a corporate technology strategy challenge.**

Bowen, F. Energy Policy, Volume 39, Issue 5 (May 2011) Pages 2256-2264.

Latest estimates suggest that widespread deployment of carbon capture and storage (CCS) could account for up to one-fifth of the needed global reduction in CO₂ emissions by 2050. Governments are attempting to stimulate investments in CCS technology both directly through subsidizing demonstration projects, and indirectly through developing price incentives in carbon markets. Yet, corporate decision-makers are finding CCS investments challenging. Common explanations for delay in corporate CCS investments include operational concerns such as the high cost of capture technologies, technological uncertainties in integrated CCS systems and underdeveloped regulatory and liability regimes. In this paper, we place corporate CCS adoption decisions within a technology strategy perspective. We diagnose four underlying characteristics of the strategic CCS technology adoption decision that present unusual challenges for decision-makers: such investments are precautionary, sustaining, cumulative and situated. Understanding CCS as a corporate technology strategy challenge can help us move beyond the usual list of operational barriers to CCS and make public policy recommendations to help overcome them.

√IPENZ 47/08 **Regulatory pressure and competitive dynamics: Carbon management strategies of UK energy-intensive companies.**

Okereke, C. and Russel, D. California Management Review, Volume 52 Issue 4 (Summer 2010) Pages 100-124.

Results are presented of the authors' examination of how competitive dynamics and regulation concerning carbon management interact at Royal-Dutch Shell, British Petroleum, Corus, BHP-Billiton, Scottish Power, and Centrica. With their significant carbon impact, such companies are often the targets of government regulation. It appears that renewable energy investment has on average shown 50 percent growth per year since 2004.

√IPENZ 47/09 **Economic benefits tied to ecodesign.**

Plouffe, S. et al. Journal of Cleaner Production, Volume 19, Issues 6/7 (April/May 2011) Pages 573-579.

This paper reports results of an empirical study conducted to assess the profitability of ecodesigned products. Indeed, the advantages related to ecodesign are numerous according to the literature on the subject. Not only is it considered to be an efficient environmental approach, it is also said to carry a number of economic advantages for the firms adopting it. Among these advantages, the potential reduction of costs and an increase in revenues are the most important drivers. Nevertheless, the economic benefits have not been demonstrated, only indicated as a potential outcome. The main purpose of the study was to assess the economic impact of ecodesigned products and to compare the results of French companies with those of Quebec.

√IPENZ 47/10 Is your project turning into a black hole?

Keil, M. and Mähring, M. California Management Review, Volume 53, Issue 1 (Fall 2010) Pages 6-31. Experienced executives know that information technology (IT) projects often fail. Like the black holes of astrophysicists, resources for big IT projects are sucked in but not much ever comes out. Obviously this does not happen overnight but rather over time in a process called escalating commitment to a failing course of action. Executive intervention is needed. This article identifies three phase in the creation of black hole projects: drifting, treating symptoms and rationalising commitment. The process is illustrated by what happened at EuroBank and California DMV. Recommendations to avert black hole projects happening are presented as are ways of detecting problems early on.

√IPENZ 47/11 Being more productive.

Harvard Business Review, Volume 89, Issue 5 (May 2011) Pages 82-87.

Allen, the author of the best seller Getting Things Done, and Schwartz, the author of the best seller Be Excellent at Anything and the CEO of The Energy Project, are two of the world's foremost authorities on increasing personal efficiency. Yet although they agree on much, their ideas on how to maximize the output of knowledge workers are fundamentally different. In this edited conversation with HBR, they discuss their own approaches and what they've learned from each other's work, along with subjects ranging from the distracting pull of e-mail to the benefits of napping in the middle of the workday. Allen has developed a system of time management that encourages workers to regularly make to-do lists-and helps them blast through the items on them. Breaking down big tasks into smaller "next actions" can help people stay focused and productive, he argues, and multitasking is to be avoided at all costs: We have only so many resources and can do only one thing well at a time. Schwartz focuses on workers' attitudes and how organizations can help them achieve a mental state that keeps their energy high. People should work for 90 minutes and then take a break to recover, he says. They should tackle their most important task first thing in the morning. And managers should consider themselves "chief energy officers," inspiring and regularly recharging the people they lead - while remembering to meet their own needs as well.

**√IPENZ 47/12 Lean product development as a system: A case study of body and stamping development at Ford.**

Liker, J. K. and Morgan, J. Engineering Management Journal, Volume 23, Issue 1 (March 2011) Pages 16-29.

√IPENZ 47/13 Lean product development research current state and future directions.

León, H. C. M. and Farris, J. A. Engineering Management Journal, Volume 23, Issue 1 (March 2011) Pages 29-42.

√IPENZ 47/14 The Generation Y effect on L&D.

Lines, D. Training Journal (January 2011) Pages 40-43.

This article looks at Generation Y in terms of its learning and development (L&D) requirements in Great Britain. Challenges for L&D specialists include content and facilitating knowledge transfer.

√IPENZ 47/15 The leading edge: Using emotional intelligence to enhance performance.

Pearman, R. T+D, Volume 65, Issue 3 (March 2011) Pages 68-71.

The article discusses methods for using emotional intelligence (EI) to improve leadership and employee performance. Consultants and organizations using EI are said to achieve clearer communication, greater employee engagement, and improved rates of job satisfaction. Recommendations on how to make a case for training programs focused on enhancing productive EI behaviours are provided. It is noted that the link between EI and the organization's goals must be clearly established within the context of the prevailing corporate culture.

√IPENZ 47/16 Ergonomics for the experienced.

Schwerha, D. J. Industrial Engineer: IE, Volume 42, Issue 11 (November 2010) Pages 35-39.

Industrial engineering plays an important role in addressing the workplace needs of the US baby boom generation. A company's industrial engineers (IE) are tasked with developing process improvement, ergonomics, safety, inventory or quality control for older workers, This benefits the entire workforce.

TECHNICAL ASPECTS OF ENGINEERING.

Abstracts for most are available on request.

√IPENZ 47/17 Punching strength of flat slabs with unbraced shear reinforcement.

Trautwein, L. M. et al. ACI Structural Journal, Volume 108, Issue 2 (March/April 2011) Pages 197-205.

√IPENZ 47/18 Design of large footings for one-way shear.

Uzel, A. et al. ACI Structural Journal, Volume 108, Issue 2 (March/April 2011) Pages 131-138.

√IPENZ 47/19 Study of influence of wind pressure and rain conditions in rain screen walls

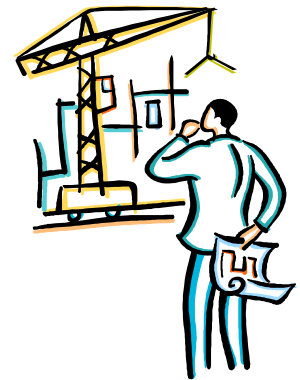
Madrid, J. F. Structural Survey, Volume 28, Issue 1 (2010) Page 46.

√IPENZ 47/20 Joining sheet panels to thin-walled tubular profiles by tube end forming.

Alves, L. M., Dias, E. J. and Martins, P. A. F. Journal of Cleaner Production, Volume 19, Issues 6/7 (April/May 2011) Pages 712-719.

√IPENZ 47/21 Current empirical ground-motion prediction equations for Europe and their application to Eurocode 8.

Bommer, J. J., Stafford, P. J. and Akkar, S. Bulletin of Earthquake Engineering, Volume 8, Issue 1 (February 2010) Pages 5-26.



√IPENZ 47/22 **A new seismic isolation system and its feasibility study.**

Jia, G. and Shi, Z. Earthquake Engineering and Engineering Vibration, Volume 9, Issue 1 (March 2010) Page 75.

√IPENZ 47/23 **Equivalent load of reinforced concrete columns under fire.**

Chow, W. K., Lin, M. and Liu, D. Structural Survey, Volume 27, Issue 3 (2009) Page 230.

√IPENZ 47/24 **Mitigation of levee failures using deep mixed columns and geosynthetics.**

Han, J. et al. Geomechanics & Geoengineering, Volume 5, Issue 1 (March 2010) Pages 49-55.

√IPENZ 47/25 **Research on anti-seepage properties of geosynthetic clay lines in landfills.**

Xiong, X., Gui, G. and Ma, S. Journal of Biomedical Science & Engineering, Volume 2, Issue 4 (August 2009) Pages 254-260.

√IPENZ 47/26 **Rating curves for dam-break flows.**

Mohapatra, P. K. Journal of Hydrologic Engineering, Volume 15, Issue 1 (January 2010) Pages 57-60.

√IPENZ 47/27 **Settlement analysis of the Shuibuya concrete-face rockfill dam.**

Zhou, W. et al. Computers & Geotechnics, Volume 38, Issue 2 (March 2011) Pages 269-280.

√IPENZ 47/28 **Analysis of factors affecting stress solution at concrete gravity dam heel.**

Hung, V. H., Cong, T. Q. and Tongchun, L. AIP Conference Proceedings, Volume 1233, Issue 1 (21 May 2010) Pages 1207-1212.

√IPENZ 47/29 **Continuum deformation and stability analyses of a steep hillside slope under rainfall infiltration.**

Borja, R. I. and White, J. A. Acta Geotechnica, Volume 5, Issue 1 (April 2010) Pages 1-14.

√IPENZ 47/30 **Economics of a hydrogen bus transportation system: Case study using an after tax analysis model.**

Bonilla, O. and Merino, D. N. Engineering Management Journal, Volume 22, Issue 3 (September 2010) Pages 34-45.

√IPENZ 47/31 **Estimating emissions on vehicular traffic based on projected energy and transport demand on rural roads: Policies for reducing air pollutant emissions and energy consumption.**

Ozan, C., Haldenbilen, S. and Ceylan, H. Energy Policy, Volume 39, Issue 5 (May 2011) Pages 2542-2549.

√**IPENZ 47/32 Earthquakes and water security: Contingency planning in California.**

Putnam, D. R. Journal of Contingencies & Crisis Management, Volume 8, Issue 2 (June 2000) Pages 103-109.

√**IPENZ 47/33 Advancing the culture of security and preparedness in the water sector.**

Morley, K. M. American Water Works Association, Volume 102, Issue 6 (June 2010) Pages 34-37.

√**IPENZ 47/34 Seismic vulnerability assessment and design of pipelines.**

Ballantyne, D. American Water Works Association, Volume 102, Issue 5 (May 2010) Pages 88-97.

√**IPENZ 47/35 Return on capital and earned carbon credit by hybrid solar Photovoltaic–wind turbine generators.**

Prabhakant, Agrawal, B. and Tiwari, G. N. Applied Solar Energy, Volume 46, Issue 1 (March 2010) Pages 33-45.

√**IPENZ 47/36 Potential for introducing renewable energy sources in the agroindustrial complex.**

Isakov, A. Z. Applied Solar Energy, Volume 46, Issue 1 (March 2010) Pages 77-79.

SPECIAL FOCUS –Flood risk management

√**IPENZ 47/37 Management of accidental flooding risks.**

Badaluta-Minda, C. and Cretu, G. Environmental Engineering & Management Journal, Volume 9, Issue 4 (April 2010) Pages 535-540.

√**IPENZ 47/38 Improving flood monitoring by the Robust AVHRR Technique (RAT) approach: The case of the April 2000 Hungary flood.**

Lacava, T. et al. International Journal of Remote Sensing, Volume 31, Issue 8 (April 2010) Pages 2043-2062.

√**IPENZ 47/39 Development and application of efficient methods for the forward propagation of epistemic uncertainty and sensitivity analysis within complex broad-scale flood risk system models.**

Gouldby, B. P. et al. Canadian Journal of Civil Engineering, Volume 37, Issue 3 (March 2010) Pages 496-507.

√**IPENZ 47/40 Fluvial flood risk management in a changing world.**

Merz, B. et al. Natural Hazards & Earth System Sciences, Volume 10, Issue 3 (2010) Pages 509-527.



√IPENZ 47/41 **Assessment and management of flood risks in Austria.**

Nachtnebel, H.-P. and Faber, R. Structure & Infrastructure Engineering: Maintenance, Life-Cycle Design & Performance, Volume 5, Issue 4 (September 2009) Pages 333-339.

√IPENZ 47/42 **A review of coastal risk management in the UK.**

Pontee, N. I. and Parsons, A. Proceedings of the ICE - Maritime Engineering, Volume 163, Issue 1 (March 2010) Pages 31-42.

This paper reviews the approaches that have been developed in the UK in order to deliver sustainable policies for managing risks from coastal erosion and flooding. One of the most important facilitators has been the adoption of a strategic framework at a national scale. This framework involves several scales of plans (shoreline management plans and strategy plans) as well as schemes. The recognition that funding sources are finite, and therefore need to be spent wisely, has also encouraged the development of more sustainable schemes. This has necessitated the development of a national appraisal methodology under which only the highest priority schemes achieve central government funding. The government also funds a national research programme to support flood and coastal erosion risk management. This paper gives examples of some of the outputs of this programme, which have included studies that have led to an improved understanding of coastal processes, coastal evolution, and risk levels, as well as the development of national data sets and management tools. The paper suggests some further improvements that could be made to the research programme. The discussion focuses on the likelihood of increasing choice of 'managed realignment' and 'no active intervention' policies in the future, their potential unpopularity with local stakeholders, and the current work under way to deal with these issues. The paper concludes with some thoughts on the priorities for coastal management over the next decade.

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√IPENZ 47/43 **The management of urban surface water drainage in England and Wales.**

Ellis, J. B. and Revitt, D. M. Water & Environment Journal, Volume 24, Issue 1 (March 2010) Pages 1-8.

√IPENZ 47/44 **Managing the flooding system's resiliency to climate change.**

Gersonius, B. et al. Proceedings of the ICE - Engineering Sustainability, Volume 163, Issue 1 (March 2010) Pages 15-23.

An increasing lack of stationarity in environmental phenomena and hence in the predictability of loading and effects makes it necessary to modify the traditional approach for planning and risk assessment of flood mitigation. The traditional approach attempts to manage the flooding system with the use of predictive/optimisation methods. These use the 'most likely' or average future projection to identify a singular optimal adaptation strategy. Because the planning and risk management in this method is often decoupled from the dynamics and uncertainty of the flooding system, this is a rather risky approach. This paper argues that responsible climate adaptation requires an alternative approach that attempts to assess and manage the resiliency of the flooding system for long-term future change. The aim of such an approach is to keep the system within a configuration of states that gives at least acceptable functioning despite the occurrence of possible changes. The paper proposes an options planning and assessment process for managing the resiliency of the flooding system to climate change. This process explicitly acknowledges the

uncertainty in future climate conditions by introducing and implementing flexibility (real options) into the designed components of the flooding system.

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√IPENZ 47/45 **Flood risk management in Dutch local spatial planning practices.**

Neuvel, J. M. M. and van den Brink, A. Journal of Environmental Planning & Management, Volume 52, Issue 7 (October 2009) Pages 865-880.

√IPENZ 47/46 **Integrated urban flood risk assessment-adapting a multicriteria approach to a city.**

Kubal, C. et al. Natural Hazards & Earth System Sciences, Volume 9, Issue 6 (2009) Pages 1881-1895.

√IPENZ 47/47 **Modelling shoreline evolution to enhance flood risk assessment.**

Stripling, S. and Panzeri, M. Proceedings of the ICE - Maritime Engineering, Volume 162, Issue 3 (September 2009) Pages 137-144.

Traditional flood-risk assessment considers coastal defences to be static features with foreshores represented simply with an assigned elevation and slope. However, beach elevations can vary rapidly over time, perhaps fluctuating seasonally, and often losing or gaining volume over a longer time period. Their dynamic nature ultimately influences the risk of coastal erosion and flooding. In a regional flood-risk assessment, in which beaches offer protection to a variety of backshore features such as seawalls, soft cliffs, and dunes, the ability to represent the beach dynamics fronting these defences is important. At regional scale, it is also necessary to consider the various backshore environments that may be encountered over a long stretch of coastline, and how their individual processes affect flood risk, particularly if they are erodible. An integrated framework of dynamically linked numerical models of coastal processes and statistical analysis methods is being developed to enhance regional flood-risk assessment via consideration of coastal evolution and foreshore morphodynamics. The framework is run entirely from within commercially available geographical information system software where model operation and numerical output is managed; standard geographical information system analysis and database capabilities are therefore also available within the modelling system. This paper outlines the basis of the modular framework, and demonstrates how flood-risk assessment is enhanced.

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√IPENZ 47/48 **Flood risk assessment in European river basins: Concept, methods, and challenges exemplified at the Mulde River.**

Meyer, V., Haase, D. and Scheuer, S. Integrated Environmental Assessment & Management, Volume 5, Issue 1 (January 2009) Pages 17-26.

√IPENZ 47/49 **HESS opinions: "Classification of hydrological models for flood management".**

Plate, E. J. Hydrology & Earth System Sciences, Volume 13, Issue 10 (2009) Pages 1939-1951.

√IPENZ 47/50 Risk creation, bearing and sharing on Australian floodplains.

Handmer, J. International Journal of Water Resources Development, Volume 24, Issue 4 (December 2008) Pages 527-540.

√IPENZ 47/51 The absorbent city: Urban form and flood risk management.

Urban Design and Planning, Volume 161, Issue 4 (December 2008) Pages 151-161.

Cities have always been built in hostile and harsh environments. Technological advances have helped increase the safety and security of their inhabitants and, to a large extent, have divorced the urban area from local environmental constraints. However, the dominance of economic issues in the development of urban form has created a legacy of exposure and vulnerability to flood risk, and a growing recognition of the limitations of this methodology has led to a desire to manage flooding in a way more in harmony with nature. This paper contends that, with regard to flood risk management, there has been a transition from self-protection to engineered defence to the current ideology of natural management, which provides a driver for consideration of the nature of an idealised urban form that is more resilient to flood risk, designed to absorb water and minimise damage. The paper identifies reflexivity, knowledge and adaptation as the three underlying principles of a theoretical 'absorbent city' and aims to stimulate debate by describing the potential urban form of a flood-resilient urban area, according to geographical and climatic constraints. Adaptive measures needed to help increase resilience are also discussed.

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√IPENZ 47/52 Flood risk management in England: A changing landscape of risk responsibility?

Johnson, C. L. and Priest, S. J. International Journal of Water Resources Development, Volume 24, Issue 4 (December 2008) Pages 513-525.

√IPENZ 47/53 Shifts in the public-private divide in flood management.

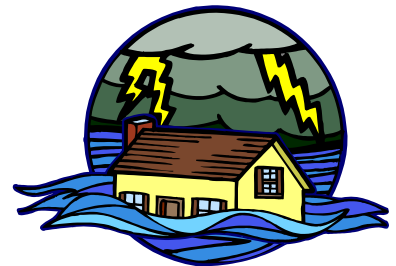
Meijerink, S. and Dicke, W. International Journal of Water Resources Development, Volume 24, Issue 4 (December 2008) Pages 499-512.

√IPENZ 47/54 Households' perceived responsibilities in flood risk management in the Netherlands.

Terpstra, T. and Gutteling, J. M. International Journal of Water Resources Development, Volume 24, Issue 4 (December 2008) Pages 555-565.

√IPENZ 47/55 Strategic planning for long-term flood risk management: Some suggestions for learning how to make strategy at regional and local level.

Hutter, G. International Planning Studies, Volume 12, Issue 3 (August 2007) Pages 273-289.



√IPENZ 47/56 Managed realignment—lessons from Wallasea, UK.

Dixon, M. et al. Proceedings of the ICE - Maritime Engineering, Volume 161, Issue 2 (June 2008)
Pages 61-71.

Managed realignment often involves the construction of new sea walls at a location behind existing sea walls to create parcels of land that can be flooded to create new inter-tidal environments. It is employed in the UK to improve flood risk management within the context of flood risk management strategies, but so far most emphasis has focused upon creation of new wildlife habitat because this has been where the opportunities and funding have been found. Initial projects were relatively small in scale, but recent projects have been much larger. Scaling up the size of realignments introduces a variety of additional engineering and social challenges and the realignment of Wallasea Island in 2006 is one of the largest. There were a variety of issues encountered during the development of the Wallasea Island realignment that make it a good platform for exploring the issues and some of the solutions that have been found to date. This account describes the project and some of the measures taken to give it as high a level of social acceptability as possible. Such measures include design features for fish nurseries, provision of public access and careful liaison with affected communities.

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√IPENZ 47/57 A methodology for regional-scale flood risk assessment.

Gouldby, B. et al. Proceedings of the ICE - Water Management, Volume 161, Issue 3 (June 2008)
Pages 169-182.

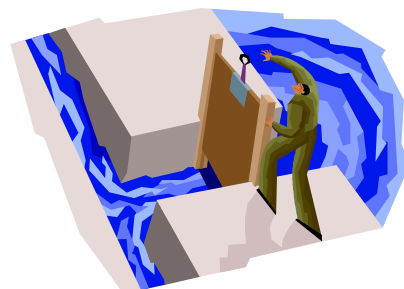
Sound flood risk management decision making is underpinned by flood risk analysis. Current methods applied at regional and local scales are often limited in their consideration of the potential for defences to fail. Ultimately this can lead to underestimates of the true risk and subsequent difficulties in justifying mitigation measures such as maintenance and replacement of defences. A methodology has been developed for assessing flood risk arising from fluvial and coastal sources that explicitly considers defence failures represented through fragility curves. This method requires consideration of flooding scenarios involving multiple defence section failures and flood events ranging in severity. It has therefore been necessary to develop a purpose-specific flood spreading method that is capable of simulating many flood events in practical timescales. The method has been applied to the Thames Estuary, where outputs including spatial maps of flood risk and defences attributed with residual risk have been used to support decisions relating to strategic flood risk management over the coming century.

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√IPENZ 47/58 Improvements on flood alleviation in Germany: Lessons learned from the Elbe flood in August 2002.

Petrow, T. et al. Environmental Management, Volume 38,
Issue 5 (November 2006) Pages 717-732.



√IPENZ 47/59 **Managing changing risks to infrastructure systems.**

Hall, J. et al. Proceedings of the ICE - Civil Engineering, Volume 159, Issue 6 (November 2006) Pages 21-27.

Civil engineering infrastructure systems are vulnerable to the effects of natural hazards such as flooding, landslides, windstorm and coastal erosion. Risk analysis provides a rational approach to analysing the threat these phenomena pose and identifying efficient options for system management. This paper presents a general formulation of the risk-analysis problem for an engineering system subject to environmental loads. However, most of the variables that determine system behaviour may be subject to long-term change, for example due to climate change or structural deterioration. The uncertainties in appraisal of infrastructure over extended timescales can be considerable, so a framework is presented for systematic analysis of uncertainties and robust decision making.

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√IPENZ 47/60 **A partnership approach to managing flood risk.**

Crossman, M., Richardson, D. and Milne, J. Proceedings of the ICE - Civil Engineering, Volume 159, Issue 6 (November 2006) Pages 41-45.

Flood risk poses a significant threat to many communities and, whereas measures can be taken to reduce the likelihood and impact of flooding, the risk can never be eliminated altogether. Insurance provides a useful means of spreading the residual risk and this paper provides a description of the UK partnership that enables insurance, backed by private-sector capital, to be made available on the basis of Government commitment to manage risks. It describes the benefits of this approach compared with that taken in other parts of Europe and makes the case for further broadening and deepening of partnership as climate change and socio-economic development give rise to increasing risks.

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√IPENZ 47/61 **Future flood risk management in the UK.**

Evans, E. et al. Proceedings of the ICE - Water Management, Volume 159, Issue 1 (March 2006) Pages 53-61.

The Foresight Future Flooding project has analysed future flood risk in a scenario framework for the whole of the UK. The analysis predicts increasing flood risk unless current flood management policies and investment levels are changed, with up to a twentyfold increase in economic risk by the 2080s. The increase is attributable to a combination of climate change and increasing value of household, industrial and infrastructure assets. Potential responses are assessed in terms of the three pillars of sustainability: social, environmental and economic. The work described has formed much of the evidence base for the new government strategy for flood risk management in England, 'Making space for water'.

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√IPENZ 47/62 Flood management: Lessons from a US city.

Pepper, A., Stonecipher, C. and Vein, K. A. Proceedings of the ICE - Municipal Engineer, Volume 151, Issue 4 (December 2002) Pages 295-304.

The traditional means of flood defence in the UK has been to either increase the capacity of the watercourse or to build barriers between the watercourse and property at risk. The latter approach was used in the city of Grand Forks, North Dakota, USA, but in 1997 the raised defences (levees) were overwhelmed by a flood event with an annual probability of less than 0.5% (i.e. greater than a 1-in-200-year event). Flood management is now superseding the narrower engineered solution of flood defence alone, and while flood management may well include raised defences in some areas, other approaches are also used, as the solution to the Grand Forks flood risk shows. Here large-scale removal of property from one part of the floodplain has prevented that area from incurring further damage and has also provided more 'space' for the river in flood times. Differences between the UK and US situations are highlighted, including the type of flood risk, the role of the city engineer, and lessons that can be learned from the Grand Forks example

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√IPENZ 47/63 Interdisciplinary planning of nonstructural flood hazard mitigation.

Hayes, B. D. Journal of Water Resources Planning & Management, Volume 130, Issue 1 (January/February 2004) Pages 15-25.

√IPENZ 47/64 Adapting to climate: A case study on riverine flood risks in the Netherlands.

Tol, R. S. J. et al. Risk Analysis: An International Journal, Volume 23, Issue 3 (June 2003) Pages 575-583.

√IPENZ 47/65 The role of flood forecasting and warning in sustainability of flood defence.

Khatibi, R. and Haywood, J. Proceedings of the ICE - Municipal Engineer, Volume 151, Issue 4 (December 2002) Pages 313-320.

Flood defence measures do not provide a total solution to flood management but can significantly mitigate flood risks. They are often implemented as a combination of a whole range of measures, including flood forecasting and warning services. Historically, these services have often been provided as a last resort without identifying their relative contribution to overall flood protection. This paper offers one possible solution for integrating these services into the body of other flood management measures through quantifying the relative contribution of the individual measures. The need for the realisation of the solution depends on stems from two major projects: (a) a research and development project on real-time modelling commissioned by the National Flood Warning Centre of the Environment Agency (the Agency); and (b) the project of Catchment Flood Management Plans (CFMPs) run by the Agency and the Department of Environment, Food and Rural Affairs (DEFRA). The paper outlines the context of both projects and shows that flood forecasting and warning, as the management of flooding incidents, is integrated qualitatively to CFMPs. It also presents a tentative solution for integrating the relative contribution of individual flood management measures to mitigating flood risks.

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