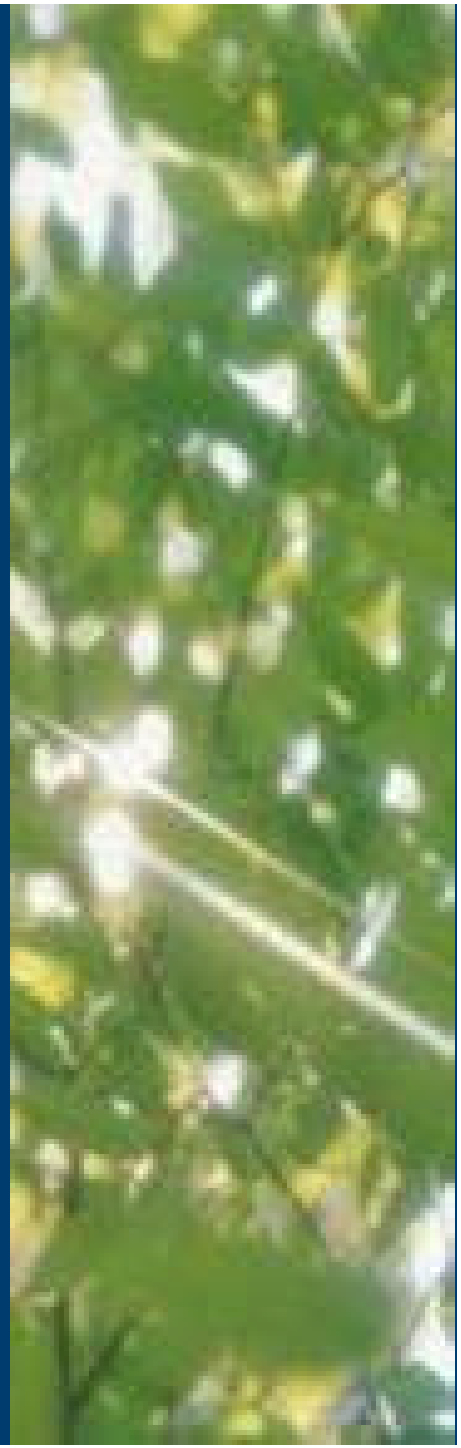
Environment Sustainability & Energy Forum

RSC | Advancing the Chemical Sciences



Remit of ESEF

- The role of this body is to set, drive and deliver the **strategy for environmental, sustainability and energy issues** within the RSC and in doing so **increase coherency** and **enhance current activities** within RSC committees, special interest groups and other bodies in environmentally related affairs.

www.rsc.org/ESEF

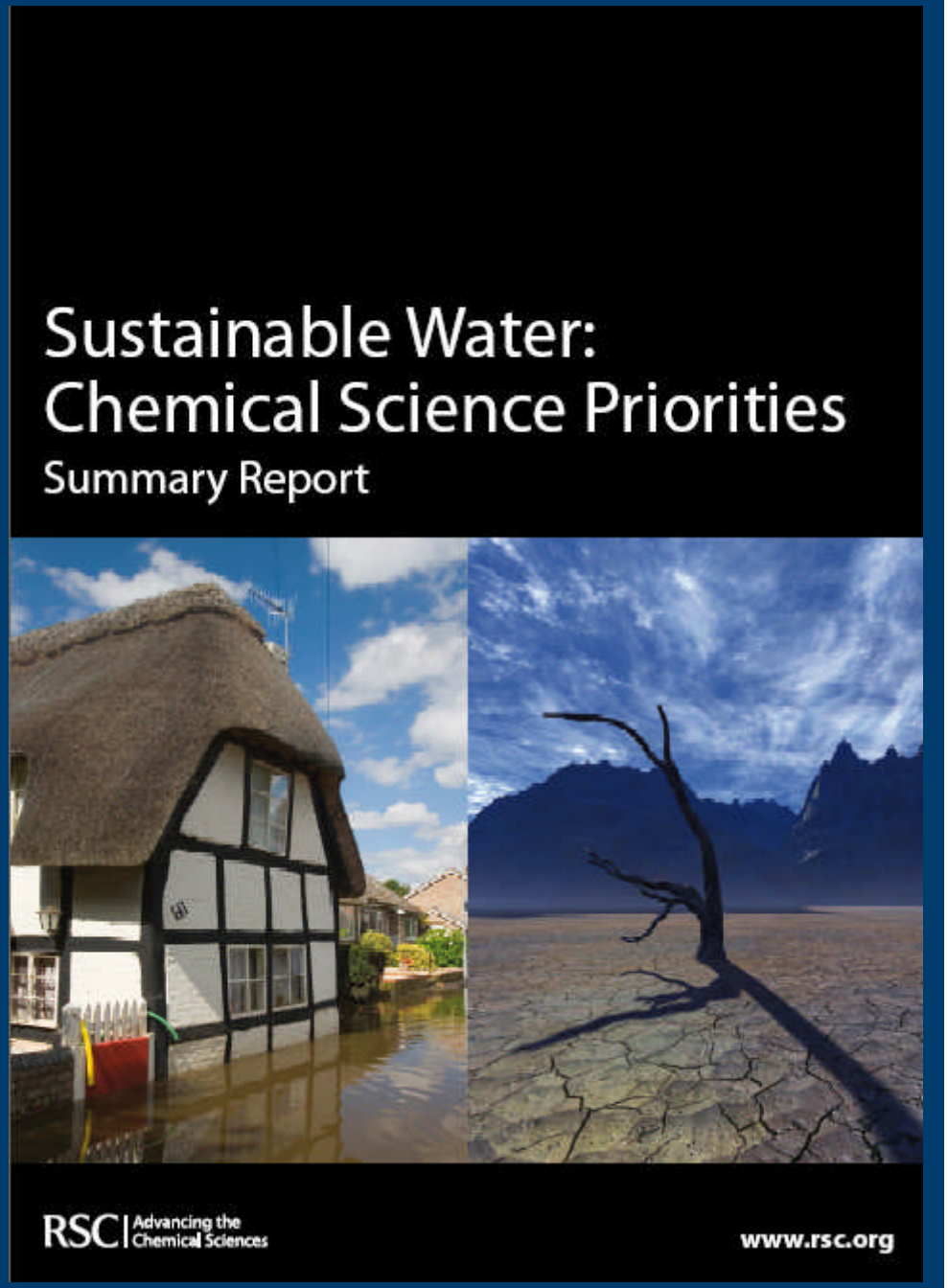
ESEF Priority Areas

- Sustainable Water
- Sustainable Energy
- Chemistry of the Natural Environment
- Green Chemical Technology

RSC | Advancing the Chemical Sciences

The report

http://www.rsc.org/water



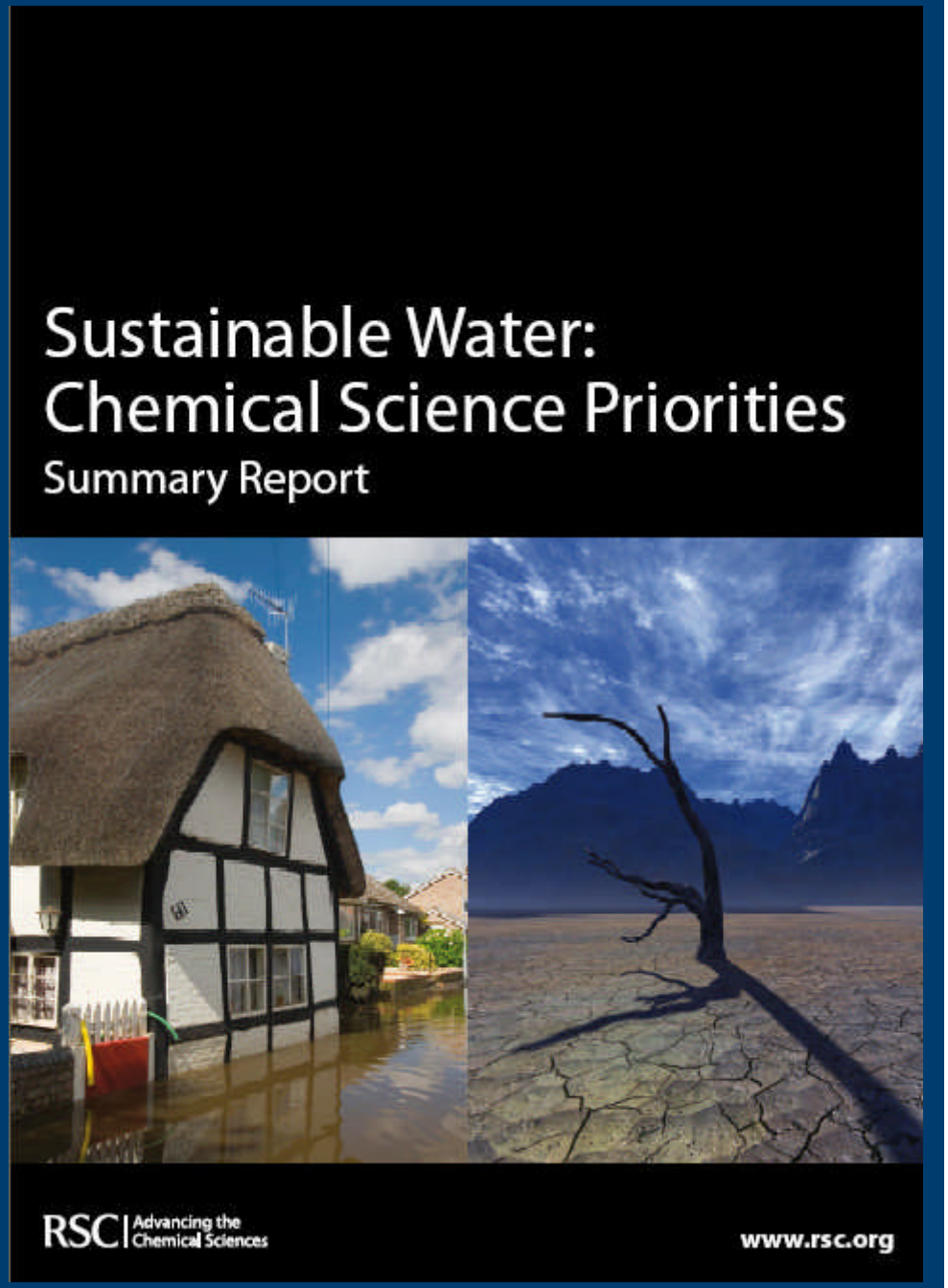
RSC | Advancing the Chemical Sciences

Report Outline

- Water resources
- Water needs: The demand for water
- Water treatment
- Water monitoring
- Input and fate of contaminants in the aquatic environment
- Water and health
- Water efficiency and management
- Green Product Design

Recommendations

http://www.rsc.org/water



RSC | Advancing the Chemical Sciences

Grey water re-use

Pursue the introduction of a universal statutory standard for sub-potable water.

Actions:

- Organise a working group bringing together key stakeholders to discuss and address issues surrounding grey water re-use
- Write position paper or report about outcomes from the working group
- Delivering and helping to interpret information to policy makers and regulators (as appropriate) in order to help them regulate effectively

Water science skills and education

Promote the need for improving skills in the chemical science and aspects of continuous process improvement.

Action:

- Collaborating closely with industry to establish their expectations in university graduates
- Develop a syllabus for chemistry courses that will enable employees to train for qualifications whilst working in the water industry
- Delivering and helping to interpret information to policy makers and regulators (as appropriate) in order to help them regulate effectively

Emerging contaminants

To understand and accurately predict the environmental fate of man-made chemicals, particularly emerging contaminants.

Action:

- Organise a steering group on emerging contaminants
- Answer questions regarding acquisition, validation and interpretation of water samples
- Using the key report findings regarding sustainable water to educate key stakeholders in the water supply chain
- Organise RSC conference or workshop on emerging contaminants
- Write a health and safety note on emerging contaminants

Green product design

To design chemicals and products that are highly effective in their use, and at end of life, are reusable and/or recyclable or degrade quickly in the environment.

To widen the adoption of the principles of green chemical technologies, and the principles of integrated pollution prevention and control, to chemical manufacture, with an aim to reduce waste, energy use, and water use.

Action:

- To form an expert working group on green product design, to advise on how to ensure sound and objective science is used in defining any legislation and regulations relating to the control of ingredients and formulation of consumer products.

- To promote the use of environmental life cycle analysis of products and systems in industry.

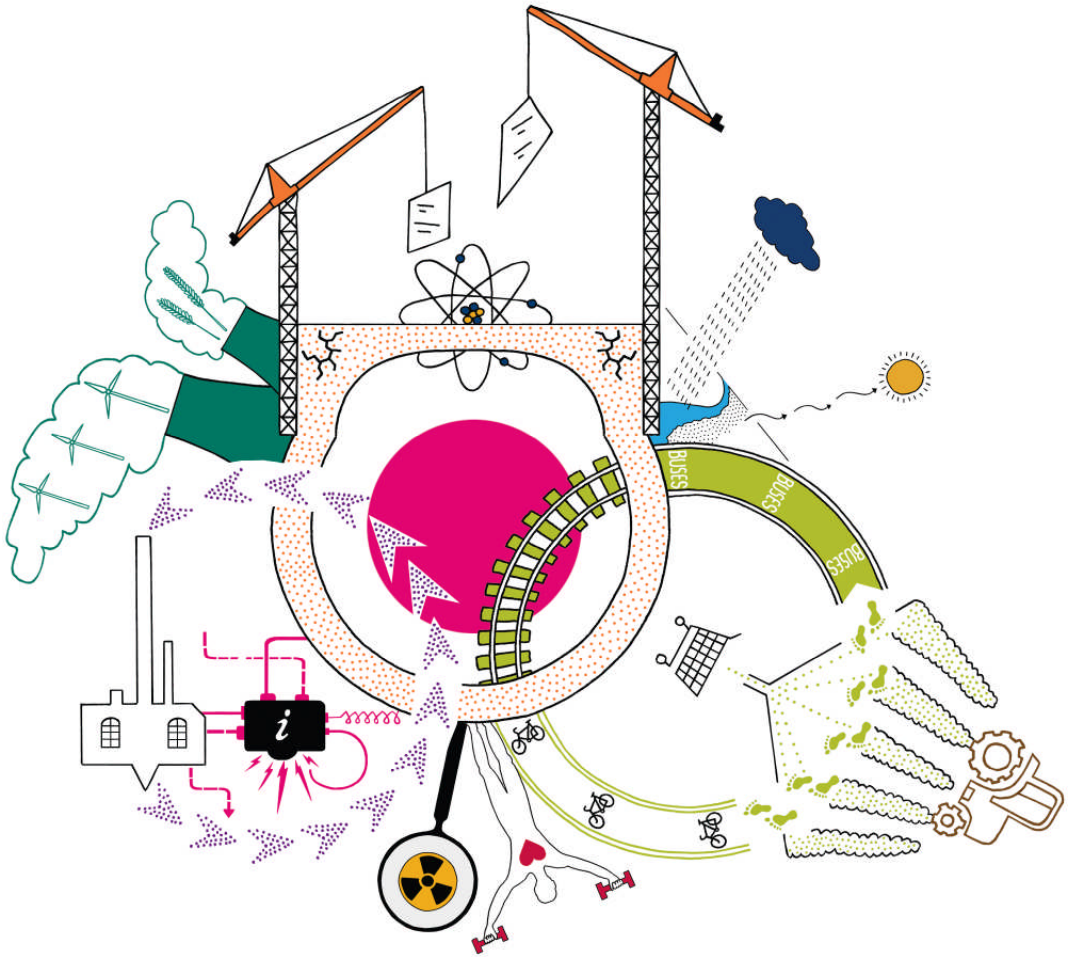
Water monitoring

To develop, demonstrate, and deploy sensor networks that provide accurate real time measurements of the status of European water quality, so as to inform strategies for improving water quality across Europe.

Action:

- To review the instruments, sensors and analytical approaches and techniques that may be best applied to meet the needs of WFD
- To promote collaboration between water engineers and scientists and materials and sensor engineers and scientists
- To promoting combined sensor and materials research and development, and transferring the technologies into the water industry
- Development of smart pipes that allow monitoring and treatment of potable water and wastewater *in situ*

RSC Roadmap - Responding to Global Challenges



RSC | Advancing the Chemical Sciences

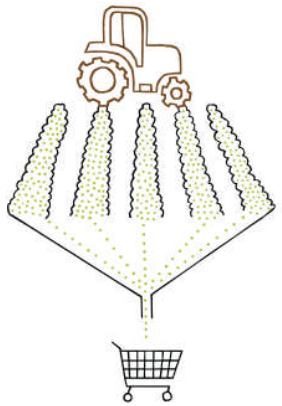
Where have we got to?

Scientific Priority Areas

- Energy
- Food
- Future Cities
- Human Health
- Lifestyle & Recreation
- Raw Materials & Feedstocks
- Water & Air

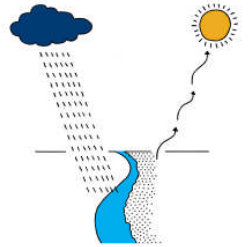
Horizontal Issues

- Public Engagement & Trust
- Fundamental research
- Skills, education, regulation, diversity



Water & Air: Ensuring the sustainable management of water and air quality, and addressing societal impact on water resources (quality and availability).

Challenges	Potential opportunities for the chemical sciences
Drinking Water Quality Poor quality drinking water damages human health. Clean, accessible drinking water for all is a priority.	▪Energy efficient point of use purification such as using disinfection processes and novel membrane technologies. ▪Development of portable technologies for analysing and treating contaminated groundwater , that are effective and appropriate for use by local populations ie. for testing of Uranium contaminated groundwater



Energy: Creating and securing environmentally benign & sustainable energy supplies whilst improving efficiency and use.

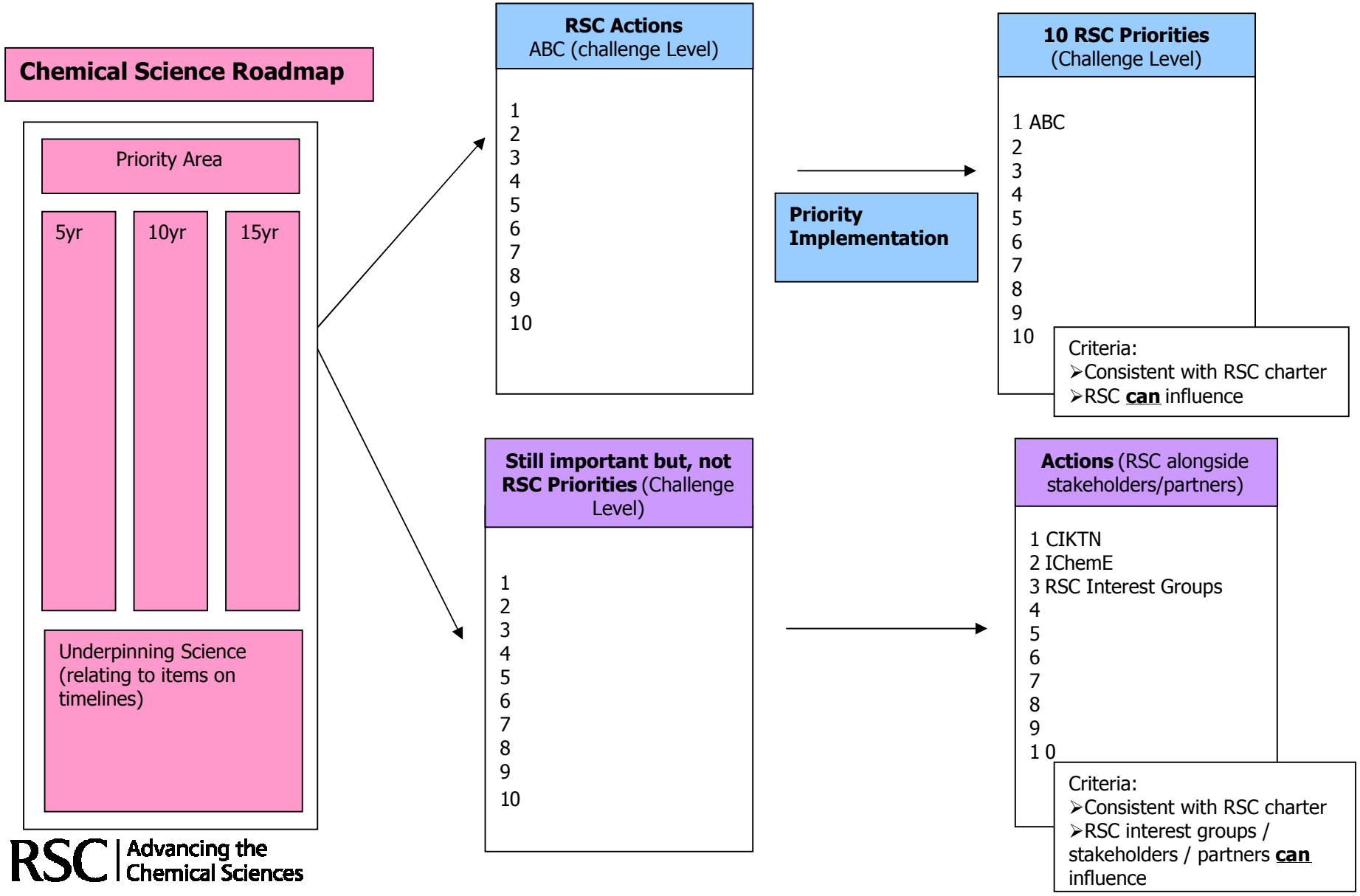
Challenges	Potential opportunities for the chemical sciences
Solar Energy Cost and efficiency concerns mean that the potential of solar energy has not yet been realised. The pace of technological advance needs to accelerate the free energy resource of the sun.	▪ Development of third-generation photovoltaic materials based on molecular, polymeric and nano-phase materials for significantly more efficient and stable devices, suitable for continuous deposition on flexible substrates.

Example – Water & Air:

Ensuring the sustainable management of water and air quality, and addressing societal impact on water resources (quality and availability).

0 - 5 Years	0 - 10 Years	0 - 15 Years
Air Quality and Climate ➢ Development of low-cost sensors for atmospheric pollutants (ozone, nitrogen oxides, particulates etc.) which can be dispersed throughout developed and developing urban areas for fine-scale measurement of air quality. ➢ Development of novel analytical techniques for detecting complex reactive molecules which affect air quality and are harmful to health.	**Waste Water:** ➢ Development of processes for localised treatment and re-use of waste water to ensure that appropriate quality of water is easily accessible. Standards for rainwater and grey water identified so that coupled to appropriate localised treatment rain/ grey water can be harvested and used for secondary purposes such as toilet flushing or irrigation of crops.	**Air Quality and Climate:** ➢ Geo-engineering solutions to climate change, such as ocean fertilization to draw down carbon dioxide, or increasing the earth's albedo by enhancing stratospheric aerosols. **Drinking Water Quality:** ➢ Energy efficient point of use purification such as using disinfection processes and novel membrane technologies. ➢ Energy efficient desalination processes developed.

What happens next?



What Happens Next?

- Initial findings to be presented at the RSC General Assembly
- Implementation – the RSC is looking to identify partners to work with to meet the challenges identified