SUMMARY

Themes for the Dutch National Science Agenda

FUTURE: IT’S BEING BUILT

THEME 1 – Perceptance & Acceptance: the human dimension

**Key words:** civil society, participatory citizenship, digitisation, healthy environment, individualisation, network society, ageing population

*Building* deals primarily with people, of all age groups, with various cultural backgrounds and diverse desires. They need shelter, to meet and socialise; meanwhile they aim for freedom, recognition, attention and peace, embedded in a safe and healthy environment. At the same time their environment is becoming increasingly complex. The world digitizes, citizens individualize and their average age is continuously increasing. Ever greater demands are made related to citizenship and personal initiative. Furthermore, urban communities become increasingly diverse and proper education has become a prerequisite to participate in society. How can interventions in the built environment contribute to the quality of life of people, both as individual and as member of society?

THEME 2 – Liveable & Efficient: Smart Cities

**Key words:** data, cultural heritage, contraction and growth, liveable, public, privacy, sensing, physical planning, smart city, metropolitan areas

All over the world and also in the Netherlands, people migrate from rural areas to metropolitan areas. New metropolitan areas are born, some of them become megalocities. Meanwhile, demographic trends such as an aging population and smaller households, impact the demands and physical planning of the urban environment. To assure the their liveability, they have to be designed for adaptability of future – not yet known – needs and requirements. For this a transition of the city is required. However, the city is a complex system that cannot be changed by mere short-term measures. What does the city look like in 2050 and how can to get there?
THEME 3 – Infrastructure & Transport: Smart Mobility

Key words: asset management, automated driving, collective versus individual, zero-hindrance logistics, integration, multimodality, multifunctional

The logistics of raw materials, products and people is very important for the economic development of a society. Especially for the Netherlands, economic growth and prosperity are closely related to logistics, and its enablers infrastructure and transport. Characteristic of mobility and logistics are two different aspects: firstly, the modality, such as car, train, ship, plane., Secondly the infrastructure, such as roads, bridges and tunnels, rail, waterways, ports and airports, pipe and cable lines. Modality and infrastructure possess very different characteristics in terms of investment, service life and speed of innovation. Concurrent fine-tuning of developments and limitations of these is a great societal challenge.

THEME 4 – Information & Interaction: Intelligence in the Built Environment

Key words: 3D printing, BIM, automation, information, monitoring, prefabrication, robotics, sensing, virtual infrastructures

The built environment largely determines our sense of well-being. Therefore, interactive and responsive environments are becoming more important: e.g. home automation, smart climate control systems, responsive lighting. Meanwhile, robotics and ICT increasingly penetrate the construction process. This requires a virtual infrastructure that connects the various actors and processes with each other, requiring enormous amounts of data. The challenge is to determine what data are needed - now and for future uses -, and how to share them through appropriate interfaces with users, ranging from construction workers to policy makers.
THEME 5 – Integration & Organisation: Smart Construction

Key words: public tendering, contracts, financing, integral, supply chain management, regulation, legislation

Commissioning and project management in building and construction industry are becoming increasingly complex. All phases of a project - from initiative, design and development to implementation and management - multi-disciplinary, multi-stakeholder and multi-functional approaches are becoming standard. For the 'license to operate' the building sector has to meet its clients, stakeholders and supply chain partners with more reliable and realistic perspectives. The construction industry is becoming more bipolar: some very large companies, and many small ones. Besides, there is a trend towards self-building on a small scale.

THEME 6 – Energy & Raw Materials: Circular Economy

Key words: circular economy, sustainability, energy transition, raw materials, materials, recycling, demolition

Our current way of life imposes a disproportionate claim on scarce resources as drinking water, space, raw materials and energy. It negatively impacts the living environment, now and for generations to come. CO2, and other waste gasses, emissions in the air lead to climate change. Pollution of surface and groundwater, soil contamination by waste dumping, it all impacts direct the quality of life and the perspective of healthy living. A large part of these undesired effects is caused by the construction at large. The implementation of a future based on sustainable use of materials and energy in the built environment is therefore of great importance for future generations.
THEME 7 – Anticipation & Adaptation: Climate

Key words: adaptability, climate change, natural disaster, robustness, safe delta areas, safety, predictability

Mainly for economic reasons people are ever more attracted towards cities. These cities are, also for economic reasons, often located in delta areas or at large rivers. These areas are especially vulnerable to extreme weather conditions. Especially climate change leads to an increased frequency of occurrence of these extremes: floods, storms and tornadoes. Periods of extreme coldness that paralyzes public life. Extreme droughts that threaten sanitation, water supply and stability of the subsoil. While periods of extreme heat can lead to shut-down of industrial production and cause increased mortality, especially among the elderly. Mitigation of these extremes requires anticipative and adaptive measures. Many of them yet to be developed.

THEME 8 – Integration of Innovation: The Future Starts Now

Key words: Dutch disease, economy of scales, knowledge management, multidisciplinary, educational needs, risk, collaboration, implementation

Most innovations, from various scientific disciplines, are ultimately applied in the context of the built environment: in homes, offices, factories, bridges, roads, airports and their installations. The speed of innovation is enormous. But how to prevent that existing optimal situations are replaced by something new that is not necessarily better. How to judge the quality of an innovation, and the necessity for rapid and massive implementation? Who carries the financial, and other, risks of failure of innovations? How to deal with innovations that have a long term beneficial impact, but also very long term financial benefits? Costs go before earnings, but what if these earnings are only cashed financially by future generations?