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A Glimpse of Healthcare's Sustainable Future

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Sustainability concepts are taking root in healthcare, the subject of more and more discussion as the spectre of climate change looms larger. The pressure to reduce environmental impact is being felt all the way through healthcare operations, in purchasing, waste management, water and energy use, energy generation, transport, food service and building design. It may not be long before everyone in the healthcare profession will need to understand what these concepts are and how they apply to the hospital environment.

So What Does Sustainable Healthcare Look Like?

Though there is much interest and work on sustainability in projects all over Europe, hospitals have yet to embrace environmental principles in quite the way as that envisaged at New Karolinska Solna (NKS), a new hospital due to open in 2015 in the heart of Stockholm, Sweden.

In 2001, an investigative committee determined that patching up the old Karolinska University Hospital site at Solna, with its disjointed, aging structures, was neither economically nor physically compatible with the intention of Stockholm Regional Council (SLL) to provide better care to patients in a better structured hospital.

"The current Solna site is comprised of around 50 buildings and is spread out, so it is hard to have modern healthcare in them," explains Anders Göransson, Environment Coordinator for NKS. Instead, the committee laid the foundations for a departure from the conventional concept of the modern university hospital, envisaging a new facility which would:

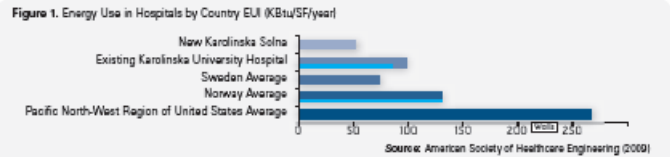
Hold 800 beds, all private rooms with en-suite bathrooms (excluding day-patient beds) Anticipate 1600-1800 patient visits per day of which 10-20% will be emergency cases, and Cost 1.3 billion EUR [2007 valuation] and be the size of the Wembley Stadium in the UK.

Being built to supercede the already environmentally-committed Karolinska University Hospital, sustainability is a top priority from the outset for this huge new development. The concept runs through the work environment for staff and employees, the patient environment for optimised care and the public environment for just about anybody in or near the hospital.

The plans encompass environmentally-friendly building techniques, materials and alternative energy sources; from a literal "greening" with grass and trees of the asphalt boundary between the new site and the Karolinska Institute, to NKS being designed to run on less than half of the existing hospital's energy requirements. Most ambitious of all is the ultimate aim of zero carbon dioxide emissions.

"We really want it to be outstanding compared to international standards - to be a big landmark. The energy goal is very low and still in the planning phase – getting that would be really good." says Göransson.

All the materials to be used in construction and during the hospital's operational life-cycle will be resource-efficient. This goes for everything from the concrete in the foundations to the walls, floors, ceilings to the lighting fixtures, bulbs and switches. Regardless of the actual systems employed, the ultimate requirement is that all energy purchased by the hospital will come from a renewable source. Even the backup power generators are held to this requirement.



"Since we have only just entered the tender evaluation phase we haven't yet decided the ways in which we are going to meet the goal of zero emissions, but boreholes and heat pumps for cooling and heating and buying renewable energy are obvious ways in which this could be done," says Göransson.

"It is harder to cool than heat the hospital, especially in the spring and summer, because medical equipment and people generate a lot of warmth. The arrangement of facades and use of glass can make a huge difference to heating and cooling costs."

NKS will also utilise district heating powered by a biomass plant and waste incinerator - although incineration is not necessarily favoured by environmental groups. District cooling is also supplied by water from the sea, which is fed to the hospital, meaning less electricity needs to be used on cooling equipment.

To ensure a favourable indoor environment, suppliers are being to provide a material inventory checked-off against the environmentally sustainable guidelines used throughout the building. A life-cycle approach is critical to the material assessments, with pitfalls from production all the way through to recycling being assessed.

"We are looking at all the materials, paint and everything, to avoid all the harmful chemicals. 30-40,000 products are being bought - it is hard work to check all of those for harmful substances," Says Göransson.

The existing Karolinska site solves the problem of day-to-day operational use of potentially harmful chemicals with a database called KLARA. KLARA allows the environment management team to keep track of how much of each chemical is being bought by which departments, making it easy to measure their success in phasing out chemicals prioritised for substitution with less toxic alternatives.

Another database system for construction materials is in use at

NKS, which pulls in information from suppliers and allows NKS to evaluate whether or not the materials meet the sustainability standards set by the hospital.

"Of course, the producers don't like to give the information, but by using the same criteria for all building projects across Sweden, the purchase volume is high enough to be able to make these demands," says Göransson.

Practices at NKS will also take into account SLL's research over the last years into the environmental effects of pharmaceuticals. SLL now has a near-complete set of persistance, biocumulation and toxicity (PBT) profiles for the active compounds in prescription drugs. This information allows doctors to prescribe, when other factors are equal, the least environmentally-harmful drug appropriate for the treatment of a given condition.

Additionally, NKS will continue with purification of nitrous oxide, which is estimated to be 300 times more potent than carbon dioxide as a greenhouse gas. Karolinska University Hospital in Huddinge was the first worldwide to introduce the recapture of nitrous oxide.

To verify its environmental achievements, NKS will be designed to meet three main environmental certifications: The international environmental management standard ISO 14001, the US LEED standard and the EU GreenBuilding Programme standard. NKS will be among a short list of hospitals that will have made an effort to earn any of these and be likely unique in achieving all three.

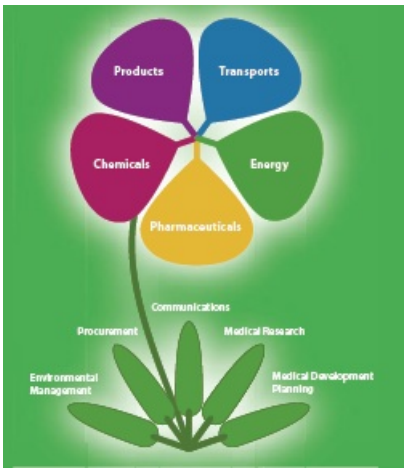


Figure 2. SLL's environmental programme

How New Karolinska Solna's Environmental Objectives are Defined by Stockholm Regional Council's Own Ambitious Sustainability Goals

It is no accident that one of the world's most ambitious healthcare projects is sited in Stockholm, whose Regional Council (SLL) has a leading position in the sustainability revolution in economy and society.

Symbolised by a five-petalled, five-leafed flower, SLL's environmental programme is in its fifth phase. Each petal represents a component of SLL's vision of a sustainable society. There is a petal each for transport, energy, pharmaceuticals, chemicals and products. Some of the goals SLL has set itself for the end of phase five in 2011 include:

At least half of the County Council's passenger and goods transports operating on renewable fuel;

All electricity and cooling to come from green energy sources and at least 75% of heating to be derived from renewable sources;

The levels of the most eco-toxic pharmaceuticals in discharge from wastewater treatment plants or in surface water to be lower than in 2005; 25% of the chemicals and chemical products which SLL identifies as having a serious effect on health and the environment to have been phased out, and 25% of the County Council's meals to be based on sustainably- produced products.


Picture 1. The corner of main building

Cutting Carbon: How a UK Trust Showed That an Environmental Vision Isn't Just for Swedes

On May 11 2009, Norfolk and Waveny Mental Health Partnership NHS Trust opened Justin Gardner House, a psychiatric intensive care and low secure unit acknowledged as one of the best mental health facilities in the UK.

Designed as a statement building which would beat NHS energy targets, the unit exemplifies many of the low-carbon principles which will be on display at New Karolinska Solna, including rainwater harvesting, ground source heat pumps, grid-connected photovoltaic arrays, natural light and ventilation, and high levels of insulation.

The commitment to a minimal carbon footprint means approximately 70% of the building's heating is free, while its use of renewable energy should save 49 tonnes of carbon per year. But how, in a cash-strapped NHS, did the facilities team convince the Trust to invest in the project?

Corporate consciousness and the support of the Financial Director are often cited as key for a hospital having strong environmental performance.

Norfolk and Waveney is no different: The former Chief Executive, who recently retired, and her incoming replacement both have a strong commitment to the environment.

"This gives us the confidence to propose environmental components to projects. In general, if there is a corporate consciousness of environmental issues, the Board and the Chief Executive will follow that sensibility," says Jonathan Stewart, Strategic Estates Manager for the Trust. "At the end of the day, if your organisation says 'yes' then you can press ahead, but if it says 'no' then progress will be impossible."

The Financial Director is a particularly important figure, because it is generally the case that exceeding the norm on environmental performance means spending more money.

"This is beginning to be seen as a shortsighted view, as capital costs look increasingly irrelevant next to true life-cycle costs," says Stewart.

Stewart also advises that cost/benefit calculations should not be approached too straightforwardly. Photovoltaic arrays, for example, take a very long time to pay for themselves and on a pure capital payback analysis would appear much less attractive than the true environmental benefits they provide.

However, the installation of photovoltaics can be supported by capital funding, which is still generally more available than revenue funding in the ever tightening budgets of the NHS. So if capital funding can be used in such a way as to reduce pressure on revenue funding it makes sense to do that - even if the capital spend is not fully recouped in the short term.

Investing in this way in renewable energy in the form of ground source heat pumps and photovoltaic cells means the mental health unit has an energy bill of only 900 GBP [1100 EUR] per year - about the same as a suburban house, which allows scarce revenue funds to be invested in ways which more directly benefit patients.

The support of the Executive, Board and Financial Director have reaped dividends for the Trust. Stewart is regularly invited to conferences to present on the project as a leading example of sustainable healthcare design, even if he is personally modest about their achievements. The fact that the project acts as a beacon for the Trust is also important for distinguishing itself from its competitors in an increasingly business-minded NHS.

Lessons

If there is no corporate consciousness of environmental issues, then address this before integrating environment considerations into a project - otherwise, the environmental aspects will just get thrown out. Approach cost/benefit calculations carefully: It's not just about quantities of money, it's also about what you spend the money on and how readily available money is for those purposes. Don't forget that strong environmental performance goes hand-in-hand with a hospital's duty of care: Good environmental performance tends to create a better work and healing environment.

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