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Next Generation Healthcare Buildings in South Africa: Complexities and Opportunities for Sustainability

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Abstract

Hospitals are widely recognised to have complex design and engineering requirements. It might be argued that the unique functional constraints and operational demand placed upon the hospital building may counter sustainability imperatives. Yet it stands to reason that, even with this complex building type, there must be opportunity to reduce embodied energy, operational energy consumption, to manage water and waste, and to promote social cohesion without compromising the desired safe, effective, efficient healing environment.

In South Africa there has been a commitment to transform the healthcare sector through the introduction of National Health Insurance which is to unfold over a 14 year period from 2011. While this is primarily a funding mechanism, it seems inevitable that over time the principles of universal coverage, eradication of inequity, and accessibility will be reflected in the architecture provided to support service delivery.

In preparation for the National Health Insurance the South African government has increased spending on healthcare infrastructure and initiated several support projects to strengthen quality and accelerate delivery of capital projects. This includes the development of a comprehensive set of new national norms, standards and benchmarks for healthcare building. South Africa has adopted a contextual approach to determining its new guidelines, norms and standards. Key concepts which have a bearing on sustainability are discussed in relation to constraints and opportunities.

The next generation of healthcare buildings in South Africa has created an opportunity to embed principles of environmental consciousness and sustainability into the policies and practices of built environment professionals in the healthcare sector.

Keywords: Sustainability, healthcare, buildings, guidelines, developing country

1. Introduction

Health outcomes and healthcare service delivery is profoundly affected by the built infrastructure provided to support it. The South African (SA) Constitution confers rights to all citizens of access to health services and to an environment which is not harmful to their health or well-being. This underpins an imperative for health planners and built environment professionals to be vigilant in planning, providing and operating healthcare infrastructure. There is significant work to be done in SA, if it is accepted that it is currently not on a sustainable trajectory, which the 2012 UNU-IHDP and UNEP report contends (p 272). According to the report this is - in large part - due to poor health status and poor life expectancy. The dual epidemics of tuberculosis (TB) and HIV/Aids resulted in a life expectancy dropping from 67 years in 1998 to around 57 years in 2012. Unemployment is estimated to be 27% and climate change is likely to lead to increasing water stress, reduced food security and loss of species and ecosystems (UNU-IHDP et al, p 272). Sustainability is about a balance between economic, environmental and social dimensions.

In SA there has been a commitment to transform the healthcare sector through the introduction of the national health insurance (NHI) system which is to be unfolded over a 14 year period commencing in 2011 (National Department of Health [NDoH], 2011). Whilst ostensibly and primarily conceived as a funding mechanism, it is inevitable that over time the NHI guiding principles of universal coverage, eradication of inequity, and accessibility to services (NDoH, 2011, pp 16 – 19) will be reflected in the built environment. In preparation for NHI the SA government has increased spending on healthcare infrastructure and the NDoH has initiated several support projects to strengthen quality and accelerate delivery of capital projects (2012). This includes the development of a comprehensive suite of new national norms and standards for healthcare buildings (N&S), with the stated objective of providing a “sustainable set for all levels of health care facilities to inform and guide work related to all stages of the life-cycle from strategic planning through to operation and disposal” (Infrastructure Unit Support Systems [IUSS], 2014).

Although SA climate change mitigation commitments, legislation and policy now make it obligatory for built environment projects to address sustainability, there is currently limited guidance on how sustainable development can be integrated in built environment projects. There is also the perception that addressing sustainability in buildings will be expensive and complicated, and that there are a range of competing social, economic and environmental priorities. Hospital infrastructure is widely recognised to have complex design and engineering requirements even without the additional dimensions of environmental, social and economic sustainability. It might then be argued that the unique functional constraints and operational demands placed upon the hospital building as a type may trump greening imperatives, invoking “defensible exemptions”.

2. Objectives

The N&S is not intended to be applied in isolation, being required over and above a number of general legislative pieces and instruments. Of relevance to this paper this includes the SA

National Building Regulations (NBR)¹, the National Environmental Management Act (NEMA) and the Infrastructure Delivery Management System (IDMS)². Nevertheless, development of the N&S provides an opportune moment to embed forward-thinking principles of environmental consciousness, as well as social as economic sustainability, into the policies and practices of built environment professionals in the next generation healthcare building.

3. Method

With reference to the current status, and a desired future healthcare estate, researchers discuss the anticipated contributions of N&S over and above the NBR, NEMA and IDMS to the sustainability agenda, as well as identifying “defensible exemptions” and possible shortcomings. The headings of the ten points articulated in the Vision of Sustainable Smart-eco Building in 2030 (henceforth “Ten Point Vision”) by Chevalier et al was adopted as a broad framework to structure a qualitative analysis. This is discussed in the subsequent narrative.

4. Ten Point Vision

According to Chevalier et al, European standards and guidelines are inclined to approach the general principles of sustainability in a reductionist and fragmented fashion: Cited are the focus on progressive energy demand reduction and energy generation targets in new and existing buildings in Germany, France, and Italy. The authors posit that sustainable principles need to be SMART (specific goals that are strategic, measurable, assignable, realistic, and time-bound) (Doran, pp 35 – 36) on the one hand, and on the other hand progressive and ambitious. Chevalier et al propose a Ten Point Vision (2009) as a framework for sustainable smart-eco building. Although this is centred on the European context and for general building types over a twenty year horizon, it covers a range of issues, and has been selected by researchers of this paper as a suitable holistic generic framework.

The Ten Point Vision suggests sustainable smart eco-conscious buildings should:

- Apply the general principles of sustainability;
- Be designed or refurbished from a life-cycle perspective;
- Be designed or refurbished to be adaptable throughout the service life, with an end-of-life strategy;
- Have its environmental impact minimised over the estimated or remaining service life;
- Be healthy and comfortable for their occupants;
- Be established with consideration of their economic value over time;
- Have social and cultural value;
- Result from all interested parties’ involvement and be designed or refurbished to meet the occupants’ needs individually and collectively;
- Be completely integrated into a territorial strategy and accessible for all; and
- Be designed or refurbished to be user-friendly, simple and cheap to operate, with their technical and environmental performance measurable over time.

¹ Conforming to National Building Regulations is a newly emerging trend in public buildings in SA, many having been declared exempt until circa 2010.

² Can be accessed online from <http://www.cidb.org.za/>, applicable to the public sector only

Each of these points is discussed systematically below as it pertains to the new draft N&S.

4.1 General principles of sustainability

The first point proposed in the Ten Point Vision is that buildings should conform to the Sustainability **in building construction** - General principles of as described in ISO 15392:2008. These principles are considered in relation to the N&S guidance in their entirety, and without regard for prioritisation and shown in Table 1

Table 1: General principles of sustainability

	<i>Criteria /Achieved?</i>	<i>Notes</i>
1	<i>Continual improvement</i> <i>Partial</i>	<i>A condition assessment method has been described. According to the published gazettes, compliance with N&S is mandatory, unless a motivated exemption is applied for and granted. This feedback mechanism could facilitate continual improvement of guidelines and by extension, buildings. However, minimal systematic updating has occurred to N&S since April 2014, limited to cost model tools which are updated quarterly for inflation and exchange rates and no means exists for systematically improving N&S.</i>
2	<i>Equity</i> <i>No/partial</i>	<i>The N&S were developed as a means of addressing inconsistencies in quality and expenditure in current capital work programs. As the application is only mandatory in the public sector its adoption will impact on new work in this sector, however is doubtful that will meaningfully impact most significant structural inequity (public vs. private disparity) and as it is not retrospectively applicable will only improve equity gradually (minimum 40 year replacement average).</i>
3	<i>Global thinking and local action</i> <i>Yes</i>	<i>The developers of the N&S have reviewed international literature and studied the Australasian Health Facilities Guidelines, British NHS Estates Standards, American Facility Guidelines Institute guides and concluded that these needed to be adapted to meet the specific opportunities and constraints of the local context. Some examples of SA context-specific considerations are with respect to preferential passive design response to climate opportunities, energy security, affordability constraints and airborne infection prevention and control.</i>
4	<i>Holistic approach</i> <i>Partial</i>	<i>The N&S address only conventional facility-based diagnostic and curative services, and do not address the health-promoting and preventive aspects of healthcare, nor alternative and traditional healthcare. To work toward overall building performance optimisation, interdisciplinary and novel approaches to design may be beneficial. N&S assume consultants retain conventional roles and responsibilities.</i>
5	<i>Involvement of interested parties</i> <i>Yes, limited to passive feedback</i>	<i>During the development phases of N&S, active involvement of identified experts and stakeholder representatives was encouraged through participation in a series of open workshops at which N&S development were discussed in themed sessions. These include participants with both clinical and built environment expertise. There is a dedicated project website which provides an open forum for sharing, dissemination and on-going stakeholder input allowing passive feedback. Involvement of interested parties could be strengthened and more actively pursued by making post-occupancy evaluation mandatory – not currently considered.</i>
6	<i>Long-term consideration</i>	<i>The N&S were drafted in a non-prescriptive way to allow for professional discretion and innovation. A future-healthcare environments workshop was held in order to anticipate future trends - such as telemedicine - which impact on healthcare infrastructure provision. However, current healthcare infrastructure planning is</i>

	<i>Partial</i>	<i>reactive and does not meaningfully take into account long-term dynamics in a structured way.</i>
7	<i>Precaution and risk</i> <i>Yes</i>	<i>The N&S provides guidance on mitigation through building design, material selection for several identified risks such as infection, slip, security (theft, vandalism), human error etc. (Worldwide healthcare associated infections and adverse events occur in 10% of admissions. Comparable studies are not available for SA, but could be expected to be at least in the same order of magnitude.) Precautionary measures for construction activities are discussed. General risk associated with construction, delivery etc. are described in complementary codes.</i>
8	<i>Responsibility (moral rather than legal/financial)</i> <i>No but described in IDMS and statutory councils</i>	<i>The public sector is characterised by a complex organisational design. Originating in the Constitution, each province enjoys relative autonomy. Infrastructure stewardship is conventionally split between the custodian (public works departments) and line departments (departments of health). Public works' core business is built environment-related but not necessarily versed in the specificities of healthcare requirements. Selection of built-environment professional consultants is usually based on a roster system. Without the prerequisite for prior experience (preferred by the private sector) there is a broader-based opportunity for participation in public-sector projects. This system does not, however, incentivise consultants to specialise in any public sector domain (including the health sector). User clients (i.e. facility-based health officials) are generally not repeat clients. Team member inexperience and a lack of formal guidance and regulation have led to extreme variation in form, quality, and cost of public healthcare infrastructure. N&S have limited guidance on roles, responsibilities and "rules of engagement". The conventions of practice are customary and described by the statutory professional councils (SACAP, ECSA, SAQSC) and through the IDMS process, however.</i>
9	<i>Transparency</i> <i>Yes</i>	<i>According to the Access to Information Act 2:2000, information related to public capital expenditure, healthcare infrastructure etc. should be available upon request. In practice this is rarely done, and this information is not readily available. Auditing in the public sector ensures compliance with the Public Finance Management Act 1999. Limited private sector information is disclosed to maintain competitive advantage. However in the spirit of generosity and pursuit of improved healthcare infrastructure, the N&S development process inspired unprecedented cooperation and sharing of information.</i>

4.2 Life cycle perspective

The N&S includes documents on commissioning; decommissioning and maintenance address life-cycle stages beyond design, but are not explicitly geared for use in the design phases where pro-active measures should be introduced. The discipline of life-cycle analysis for construction materials and eco-labelling is in its infancy in SA and development of the N&S project has concluded without adequate reference to this discipline. Practical guidance on measuring or reducing embodied energy is not, for instance, addressed. The N&S cost model has been developed to take into consideration life-cycle costs. This takes into account that different building elements and materials have different expected service lives and in this way contribute to the quest for an affordable estate which does not solely focus on minimising initial capital costs. A decommissioning document forms part of the suite, but there is no guidance to identify or address end of service life and no mechanism to ensure implementation in practice.

4.3 Adaptable

The Ten Point Vision proposes that sustainable smart eco-conscious buildings should be designed or refurbished to be adaptable throughout the service life, with an end-of-life strategy. Typically hospitals and primary health care buildings are constructed using traditional brick and mortar generally resulting in fixed non-flexible structures. In an environment where technology dives rapid advancement in service delivery possibilities there is generally very limited flexibility built into health projects.

Given highly customised layouts of portions of hospitals (such as operating theatres) as well as the imperative to remain continuously operational, repurposing many components for other uses may be challenging: hospitals as currently constructed may not be good candidates for recycling and reuse. A flexible, adaptable open building systems approach may be appropriate in order to address the system uncertainties and complex specialised infrastructure requirements inherent in provision of healthcare. Open building systems may have the distinct advantage over conventional methodologies in healthcare settings of allowing building adaptation with minimal disruption to simultaneous service delivery or compromise to patient care. Yet services are conventionally provided from fixed, immovable structures which have lifespans of some decades. There is a document in the N&S suite for application of innovative building technologies - which may include open-building technologies - for clinics (i.e. small-scale). The number of larger scale healthcare buildings internationally adopting the open-building technology approach is limited with a few notable exceptions (INO Hospital, Bern, for example). In SA, migration to open building technologies would require non-trivial construction industry reskilling and building material supply transformation. Because of this, it is suggested that the requirement for adaptability be a defensible exemption for the health sector.

4.4 Minimising impact

The Ten Point Vision proposes that sustainable smart eco-conscious buildings should minimise their environmental impact over their estimated or remaining service life.

The National Environmental Management Act (NEMA) requires, inter alia, that building developers and owners must take reasonable measures to ensure that pollution or degradation of the environment is prevented or minimised in development and operation (NEMA Part 28). Local government has the authority to require an Environmental Impact Assessment and this prerogative is frequently exercised, more especially for green-field site development.

In support of the requirements contained in NEMA, the Environment and Sustainability document in the N&S suite (IUSS, 2014) provide a description of sustainable development and translates this into specific sustainable development objectives for the built environment and provides detailed checklists tailored specifically for healthcare infrastructure. These enable the setting of explicit and challenging targets to reduce operational energy consumption, manage water and waste for projects as well as systems to ensure that these are achieved, and provide a framework for self-assessment to ascertain the performance of projects in development and operation.

4.5 Health and comfort

The Ten Point Vision proposes that sustainable smart eco-conscious building should be healthy and comfortable for occupants. Patient and staff experience, healing environments, comfortable workplaces and prevention of healthcare associated infections and other adverse events are prioritised in the N&S.

In order to achieve indoor thermal comfort the Building Engineering Services N&S guide (IUSS, 2014) recommends that interventions should be considered, singly or in combination, in a hierarchy where passive and adaptive comfort systems are considered before fully mechanical systems. While there is a current paucity of detailed local climate data, the publication of local climate characterisation is expected shortly which will enable detailed evaluation of design response. TB, which is communicable exclusively through the air, is the leading cause of mortality in the region. It is recognised that building design and engineering has a role to play in mitigating risk as it impacts heavily on indoor air quality (World Health Organisation [WHO], 2009, CDC, 2005). Healthcare facilities inevitably bring susceptible and infectious individuals into close contact. According to Joshi et al (p 12) and Menzies et al (pp 593-605) and others, healthcare workers in middle and low income countries such as SA are at between four and 135 times more likely to contract TB compared to the background population. To address this major health risk, great care has been taken to describe design and engineering approaches to airborne infection that are locally-driven and are evidence based. The SA approach to building envelope design departs from one found in many European norms in that it does not generally promote hermetic sealing to reduce energy. Buildings are not typically heated or cooled for much of the year. Furthermore, perhaps in addition to considering comfort, sustainable building design could or should address well-being as criteria.

4.6 Economic value and affordability

According to the Ten Point Vision sustainable smart eco-conscious buildings should be established with consideration of its economic value over time.

Increasing expenditure to address the healthcare needs optimally rapidly raises challenges to affordability. There is abundant evidence that increasing expenditure on healthcare systems does not necessarily yield better outcomes (OECD). SA expenditure in health service provision (tracking the global trend) has risen steadily over recent years and there is international concern over the affordability (and hence sustainability) of this growth path. SA spends 8.3 % of its GDP on public and private sector health (The Presidency Republic of South Africa, 2011) and sectors compete for funding from a limited fiscus. An important challenge to the health system is capital, operational funding and staffing resource constraints. The whole healthcare enterprise must be carefully configured to ensure that operation of the full estate is affordable and sustainable. Integrated infrastructure planning which takes staffing, and operational resources which will be manifested over the building's projected life is required. To a limited extent, the N&S cost estimation tools can provide this by means of order of magnitude projections which include indicative operational cost forecasts for the medium term funding horizon enabling long term budget forecasting and reconciliation during planning.

Healthcare spending in SA is inequitably distributed across the public and private sectors. Treasury reports that 48.5 % of expenditure amounting to R120.8 billion is attributed to the private sector in the service of 8.2 million people (16.2 % of the population). Nearly half (49.2 %) of expenditure amounting to R122.4 billion is attributed to the public sector and is in the service of the remaining 42 million people (84 % of the population) (National Treasury, 2012). Although these figures are not directly comparable (the public sector figure excluding infrastructure provision) the contrast in expenditure has seriously undermined aspirations of equity, access to care and social justice. The N&S do not address both sectors and therefore will not have a direct role in resolving this economic value disparity.

4.7 Social and cultural value

In SA healthcare services enjoy great social and cultural value and its infrastructure can be symbolic of societal values of caring. This can be demonstrated in community response to opening and closure of such institutions. In SA there are historical and emergent social and cultural distortions which are expressed in the built environment. Healthcare infrastructure can be broadly characterised according to whether it is privately or publicly funded. This distinction can be linked – albeit with some limitations – (generalisation being crude) to broadly differing capital investment and building stock traits.

The private sector generally embeds lean systems thinking in its projects and values economic return on investment and organisational agility. There is recognition that healthcare built environments are necessarily substantively built-to-purpose, and specialist expertise to brief and designs is valued. The private sector invests in developing briefing and project implementation capacity in-house and cultivates relationships with experienced built-environment professional consultants for competitive limited repeat business. The project managers who implement private sector building projects have decision-making mandate to the extent that it satisfies corporate requirements. Limited experimentation is accepted but there is generally a conservative approach to building design and capital expenditure. The private sector replicates its successes with incremental refinements and adjustments over time. The larger hospital groups have become highly experienced, savvy clients. The private sector has dedicated legislation³ which describes (amongst other things) some minimum space standards. There is general consensus that this legislation is outdated⁴ although it is still in used to regulate some aspects of service provision (such as granting of licenses for hospital beds).

Formerly the public sector was regulated by the now repealed SA Hospital Norms (SAHNorms) with reference to maximum allowable areas and costs. In the absence of national public sector legislation, the public and media tend to benchmark private sector with the public sector, and conclude that the public sector is failing. The disparity in expenditure discussed above is sometimes acknowledged (National Treasury, p 8), but there is widespread despondency and

³ The Regulation 158 (“the R158”) or Regulation 187 in the Western Cape province

⁴ last revised in 1993, in the pre-democratic era

lack of morale in the public sector despite significant successes and its crucial contribution to the uninsured majority.

4.8 Stakeholder involvement

Post-occupancy evaluations of three recently completed SA hospitals (van Reenen, unpublished) have found that there is no systematic involvement by communities in the design phase (although communities do get involved in ensuring local community employment in the facility when open and there is a structured national programme to involve local labour participation in the construction programme). There is only limited involvement of client department. For example, detailed mock-ups of rooms to convey actual size was not used as a technique

4.9 Territorial strategy

According to the Ten Point Vision sustainable smart eco-conscious buildings should be completely integrated into a territorial strategy and accessible for all. SA has a healthcare infrastructure platform which reflects the pre-democratic era: Gaps where the majority of population did not receive basic services; overlaps and duplicate services where apartheid structures were separately provided for different race groups; and private sector facilities which emerged in the 1980s, exploded post democracy to serve the insured population. The N&S guidance was originally envisaged to address all life-cycle stages but infrastructure strategic planning was removed from the scope of work. There is no evident coordinated geospatial planning programme and no [published/ discernible/ explicit] territorial strategy. Project, site and service selection does not appear to be systematically supported, except by exception, by study of accessibility and population and demand dynamics. Furthermore, leadership have expressed the perception that healthcare services may not be effectively delimited to nationals only (Lindeque, 2015). If true and unmanaged this could overburden constrained resources. Even if untrue, such perceptions may undermine social cohesion and lead to xenophobia and conflict. Given that the investment in infrastructure is on average a 40 year venture, with enormous concomitant capital, operational and human resource implications, it stands to reason that the absence of a territorial strategy is a credible concern to achieving a sustainable healthcare infrastructure platform.

4.10 User-friendliness

According to the Ten Point Vision sustainable smart eco-conscious buildings should be designed or refurbished to be user-friendly, simple and cheap to operate (i.e. maintainability), with its technical and environmental performances measurable over time. The N&S guidance⁵ requires healthcare facility design to address user friendliness for occupants. In addition to the

⁵ Ironically N&S guidance material itself is not adequately user-friendly. For convenience, and to satisfy the development time of three and a half years ab initio, the guidance was divided into 46 work-packages and each discreetly developed. This has resulted in unfortunate repetition and an unnecessary volume of material (in excess of half a million words). It is also not easy to locate or navigate in its current repository.

NBR requirements, it dictates that facilities are of inclusive design (wheelchair friendly, well-signposted, clearly laid out etc.) and in this way address user-friendliness. There is an explicit requirement to exhaust passive design technologies first, then hybrid systems and finally mechanical solutions to promote simple and cheap operation as well as to address energy insecurity.

There has been substantial, serious lack of maintenance of public healthcare facilities (with few exceptions) over a period of several years resulting in a general poor condition of infrastructure (SA Institution of Civil Engineering [SAICE], 2011). The N&S include maintenance guidance, encourages adoption of green technologies and specifies that sub-metering is installed in facilities to allow for utility consumption monitoring, benchmarking and maintenance. By contrast, the private sector is already investing in measuring technical and environmental performance and building maintenance (it is tax incentivised). It readily retrofits building to reduce emissions and install green technologies (in order to avoid carbon tax, to benefit from carbon credits and to reduce operational costs).

5. Discussion

SA has adopted a contextual approach to determining its new N&S. The new national guidelines, norms and standards with embedded sustainability practices identified above are published on an open, electronic repository gazetted into mandatory use in the public sector new capital work. The application notes expressly require implementation to be done with due diligence and application. Professional consultants are not absolved of their professional responsibilities of design, engineering and management, and are required to make use of the exemption processes where a conflict arises with professional judgement. Exemption processes are defined, requiring consultants to motivate deviations from the code, and this potentially provides a feedback mechanism to alert administrators of weaknesses in documentation and challenges in implementation, provided that this is actively monitored. As the N&S documentation and software is extensive, a structured capacity building and support programme is required to ensure implementation.

The current replacement rate of SA's healthcare infrastructure is in the order of 40 years (Abbott et al, 2008, pp 146-183). In order to address building design from a life-cycle perspective a modification of the traditional roles may be indicated. For example building engineering for ventilation and climate control is sometimes limited to mechanical design solutions. Optimised passive ventilation design through building envelop design could result in a more energy- and life-cycle-efficient solutions but may require both redefining the engineer and architect's traditional roles and methods of interaction, as well as client procurement practice. It seems likely that unless these requirements are anticipated in the pre-project stages (conception of need, briefing and contractual arrangements of consultants) that business will be conducted as usual and that conventional practice will remain pervasive.

6. Conclusion

There is a legacy sectorisation of healthcare provision split between public and private sectors with distorted investment patterns, reflected in current built form for healthcare infrastructure in SA. Emerging policy aims to improve equity and access which could result in a new generation of healthcare architecture over time but needs to be opened to innovation in infrastructure processes as well.

If it is accepted that the European approach to sustainable practice is exemplified in the single workshop, and that it is relevant to South Africa, it can be concluded that the N&S succeed partially in applying the general principles of sustainability. N&S require healthcare facilities to be designed or refurbished from a life-cycle perspective and provides some guidance on an end-of-life strategy. SMART benchmarks have been provided to minimise environmental impact over the estimated or remaining service life. A number of important healthcare-sector and contextually responsive health and comfort approaches have been incorporated. Some infrastructure is established to ensure involvement of all interested parties' and be designed or refurbished to meet the occupants' needs individually and collectively. Design, engineering and refurbishment which is user-friendly, simple and cheap to operate, with its technical and environmental performances measurable over time is discussed from a number of perspectives in the N&S.

It might be argued that the requirement that healthcare facilities be designed or refurbished to be adaptable throughout the service life, may be a “defensible exception”, at least in the short to medium term given the complications described above. There are a number of sustainability criteria which may not be adequately addressed in the N&S. Whilst healthcare infrastructure undoubtedly has great social and cultural value, there is concern that sectorisation, and economic value will not be improved through the N&S, and that this is key to achieving a sustainable healthcare infrastructure platform. Finally there may not be the desired sustainable estate unless there is the introduction of a completely integrated territorial strategy in relation to both public and private sectors to attain facilities and services are accessible for all.

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