Negotiating power and constructing the nation : engineering in Sri Lanka

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Introduction

There is a close intimacy between Sri Lankan engineering and Sinhala nationalism. The narrative of the identity of the Sinhalese who are the majority community of the island of Sri Lanka, draws heavily on engineering; on its technological expertise and development as a source of pride and as an indication of civilizational superiority. Children and students have been brought up in an environment where they have heard stories about the great engineering works of their forefathers. The names of eminent engineers of modern times also appear in the narrative described above as a testimony to the continuity of this great engineering tradition of the Sinhalese. While learning the principles of modern engineering at the University of Moratuwa – a prominent technical university in the Western Province, undergraduates continue the narrative of their childhood, forming clubs and spending their leisure time in discussions about the engineering legacy of the island and of the Sinhala nation. And, as if providing symbolic proof of this close relationship between engineering and the nation, my own colleagues at the engineering faculty were seen at the forefront of the Sinhala nationalist movement during the 1990s and 2000s. Patali Champika Ranawaka, the current Minister of Megapolis and Western Development and Asoka Abeygunawardana, the current Chairman of the Strategic Enterprise Management Agency and an advisor to the President, were for example, instrumental in forming the ultra-right wing nationalist party *Jathika Hela Urumaya* (the National Heritage Party), an important and a recent milestone in further ethnicising the nation's politics.

Yet in spite of this close relationship between engineering and nationalism, the level of technological development in the island remains low when compared to other countries in the region and the world. Since gaining independence from the British in 1947, Sri Lanka's closest neighbour India opted for a path of industrialization, whereas Sri Lanka which obtained independence a year later, showed no interest in such a trajectory. The island remained a rice-producing agricultural country till recent times, when it has moved towards becoming a service sector economy, with no impressive performance to show in the industrial sector, where engineering matters the most.

This thesis explores how and why this particular narrative of the Sinhalese as a great engineering and technologically advanced nation has been constructed, modified and revised over time. It also looks at the people and engineering projects that have been included as well as excluded, in this process. It poses questions as to how and why at specific moments in the past, especially in the recent past -

certain individuals and events have taken on significance. This thesis also particularly studies how engineering as a narrative and also as a technical site, is linked to Sinhala nationalism.

The following specific questions are posed to guide the general inquiry described above.

1. What are the socio-political factors that influenced the inclusion and the exclusion of engineering in the nationalist narrative?

2. How have the pre- and post-independence ethno-nationalist tensions influenced and defined engineering?

3. Why and when do nationalist narratives undergo revision and what role does engineering play in such instances?

4. How far is engineering within the Sri Lankan context integrated with Sinhala nationalism?

While the narrative of Sinhala identity is about the high engineering skills of the nation's forebears, there is a school of thought that the origin of this narrative is recent. This argument that sounds convincing at first glance, seems more complicated as the debate on the technologically advanced ancient kingdom of Anuradhapura (fourth century BC to eleventh century AD), indicates. Conducting a discussion on Anuradhapura and the Sinhala Buddhist nation, Nissan (1989) is of the opinion that Anuradhapura was 'discovered' in the jungle by the British colonials and the ruined cities appealed to the romantic imagination of the European (p. 69). According to Jeganathan (1995), the two major clusters of ruins of tanks (i.e. interconnected systems of artificial reservoirs) and Buddhist stupas (i.e. large domes) excavated and restored by the colonial regime since the nineteenth century AD, provided the material infrastructure upon which the narrative is constructed (p. 120). The availability of 'sights/sites' on the ground provided credibility for George Turnour's translation of the *Mahavamsa*, the authoritative historical text that established Sri Lanka as a Sinhala Buddhist country. The *Mahavamsa* in turn, serves as the definitive text to authoritatively date and meaningfully encode the technological landscape excavated and restored (pp. 114, 123). Jeganathan (1995) describes how nineteenth century accounts by a range of Britishers such as William Knighton, James Tennent, Edward Upham and Thomas Skinner contributed to glorifying the excellence of Sinhalese engineering, a skill that was compared with the technological achievements of the Greeks, Romans and Egyptians in ancient times (pp. 116, 119). This forceful argument by Jeganathan was the reference when Jeganathan and Ismail (1995) declared that "Anuradhapura was "made" in mid-nineteenth century" (p. 6). However, for Sivasundaram (2007), the passage from the rule of pre-colonial monarchy to colonial rule was more gradual than is assumed

by Nissan and Jeganathan. By referring to non-colonial sources such as religious rituals, local legends, poems, ballads, the proclamation of land grants and temple paintings which reflect pre-colonial memories, he is of the opinion that "it does violence to the past to take an exaggerated view of the discursive powers of British colonialism and its ability to create a new meaning for Anuradhapura" (p. 116). While colonial sources often present Europeans as lone discoverers, British archaeology depended significantly on indigenous knowledge and assistance provided by local guides, informants and priests (p. 138). Therefore, without proposing an exact date of origin, this thesis treats the construction of the narrative of the Sinhalese as a nation of skilled engineers as a continuous process that is reconstructed on a day to day basis, modified and revised at various times.

This study can be positioned at the meeting point of the two spheres: technical and social or more specifically, technology and nationalism. Insensitivity to the link between the technical and social has left the common space shared by technology and nationalism grossly under-investigated, within the Sri Lankan context. Globally and over time, understanding of the relationship between the technical and social spheres has undergone change. Scholarly work indicates three phases. Up until the mid-nineteenth or the early twentieth century, technology was understood as a branch of the arts and as a space linked to everyday life. During this era, technology was known as a "mechanical", "practical", "industrial" or "useful" art, conveying a broad meaning that was not confined to technical artefacts and the principles of production alone, but which related to how society was organised to facilitate the process of production, of which the end product - the artefact - tended to serve a particular social function. The image of industrial arts was linked not just to technical details but to everyday life, artisanal skills, work and egalitarian ethos of the early republic (Marx 1994; Mitchem and Schatzberg 2009). However, according to Marx (1994), technology entered its second phase by the mid nineteenth century and gained full independence from its dependency on society by the time of the First World War. With the spread of state driven applications in many spheres, technology was seen to be represented by images of large-scale, complex, hierarchical, centralized systems such as railroads, telegraph and telephone networks, chemical industry, electric light and power grids and the automobile industry. At the same time, the early enlightenment idea of progress directed towards a more just republican society was generally replaced by a politically neutral, technocratic idea of progress aimed at the continuing improvement of technology (p. 241). This relieved the historical burden on technology to earn its legitimacy through performing social functions defined by society. This interpretation of progress in terms of the continuing advancement of technology bestowed on it the autonomous space

detached from worldly human affairs. Technology in this second phase was on its own, left to define its path of evolution through its own internal logic.

However, the Society of History of Technology (SHOT) established in the United States in January 1958 and the journal *Technology & Culture* (*T&C*) launched in 1959, have set the ground for the modern systematic study of technology[1] making way for the third phase (Roland 1997; Hughes 2009; Staudenmaier 2009; Post 2010). These studies have helped to broaden our understanding of technology and engineering by re-establishing the links between the technological and social spheres and by re-iterating their interdependency. Even though they have yet to dislodge the day to day mainstream understanding of technology which treats technology as an autonomous space[2] these studies have academically restored the umbilical cord between the technological and social that was cut during the time technology attained autonomy. Bijker et al (1989[1987]) describe three features of this third phase of renewed understanding of technology, that differentiate phase three from phase two. Authors who conducted studies on technology moved away from the approach of seeing invention as the work of an individual and to use this involvement by an individual genius as the central explanatory model. They also distanced themselves from the approach of technological determinism[3] and moved away from making distinctions among technical, social, economic and political aspects of technological development. This disagreement with the idea of separation of spheres as technical, social, political, etc. and holding their boundaries to be fixed, is also reflected in Bijker and Law (1992). Hughes (1986) based his critique on rigid boundaries among analytical categories when he developed the concept "seamless web" to explain the operations of technological systems. He recommended that “the historians and sociologists choosing such subjects would do research and writing in which the technical, scientific, economic, political, social, etcetera, became overlapping, soft categories". If a seamless web is the solution proposed by Hughes to deal with rigid boundaries of fixed categories, the school of actor-network has its own solution. Michel Callon, the French sociologist, in dealing with technology where technology is seen as a network of heterogeneous actors both human and non-human, questions the

1 The next important landmark in strengthening the systematic study of technology was the workshop held in early 1980s at the Twente University of Technology, Netherlands with the participation of historians, sociologist and philosophers of technology. It was the lengthy discussion held at the workshop that laid the foundation for the study on technology in three directions based on three approaches; taking technology as a social construction (i.e. social constructivist approach), seeing technology as a system which is an integration of technical, social, economic and political aspects (i.e. systems approach), and considering technology as an actor of networks where agency is allocated to both human and non-human actors (i.e. actor network approach) (Bijker et al 1989[1987]).

2 This treatment to technology seems to be shaken at times by major technological disasters and failures since the latter part of the twentieth century, generating a pessimism in the technological world (Marx 1994).

3 Technological determinism refers to the idea that technology develops as the sole result of an internal logic and then, unmediated by any other influence, moulds society to fit its patterns (Winner 1980).

practice of categorising or compartmentalising the elements in a system or a network "when these elements are permanently interacting, being associated, and being tested by the actors who innovate?" (Hughes 1986, p.287). Instead of using categories such as technical, social, political etc., the actor-network engages actors who are not bounded by disciplines[4] (Ibid).

This broader understanding of technology, while shedding new light on the way we see the world, has resulted in expanding the scope of research conducted not only on technology but also in the area of socio-political investigation. Bijker (2009) identifies contemporary societies as “thoroughly technological, and all technologies” as “pervasively cultural”. “Technologies do not merely assist in everyday lives; they are also powerful forces acting to reshape human activities and their meanings” (p. 607). MacKenzie and Wajcman (1999[1985]) explain this integration in simple words when they say that the "rich or poor, employed or non-employed, woman or man, 'black' or 'white', north or south - all our lives are intertwined with technologies, from simple tools to large technological systems" (p.3). If one expands the definition of technology in the way MacKenzie and Wajcman defined to include even tools that facilitated the evolution of human civilisations and take into consideration the technological advances in different parts of the world throughout human history, one can also argue that the world remains a technological one for all times[5]. This understanding expands the horizons of technical inquiry into technological systems on the one hand, and broadens on the other hand, the study of society within which technology is now seen as an embedded feature. Technological sites which were considered irrelevant in humanities and social sciences too become important field sites for social research under this broadened understanding of technology.

Except for a few isolated attempts, the examination of technology or society by treating Sri Lanka as a socio-technological space is a practice yet to be established. On the one hand the mainstream discussion on engineering, technology and technological change remains a highly specialized discussion on technical content and with hardly any reference to the social world. The vast pool of literature in the study of history, political science, anthropology, social sciences, etc. on the other hand, do not pay

4 This broader understanding of technology constructed through numerous case studies too met critique on several grounds. While some targeted the approach of Social Construction of Technology in particular, others had issues with the approaches of this third phase in general. One of the critiques that is of special importance to this discussion, in my opinion, is the bias of technology studies in technical aspects. While technical stands as a single item in this broad understanding of technology, the practice of technology studies remained technical-focused.

5 Commenting on a study on ancient irrigation systems, Bijker (2007), questioned the wisdom of creating categories such as ‘traditional’ and ‘modern’ to identify technologies, as the Indian water management practice under discussion incorporated advanced hydraulic science and engineering, at least in the sense that it demanded the application of modern engineering principles to understand why ancient Indian irrigation has functioned so well.

adequate attention to technology as a site of socio-political activity. For example, the narrative of "A History of Sri Lanka" by K. M. de Silva (2005[1981]), a popular reference for historical details of the island, pays no attention to the role of engineering works in shaping Sri Lankan society during the last century. A notable exception is the attempt by R. A. L. H. Gunawardana to discuss the role of technology in the formation of 'power sharing state' and hydraulic civilisation from the third century AD to ninth century AD. According to Gunawardana (1985b) the discovery of the cistern sluice, improvements in metallurgical technologies enabling the production of steel tools and the development of techniques of heavy construction transformed early agrarian society into a hydraulic civilisation. The sluice which helps to release water from reservoirs at a pressure which would not damage the embankment, paved the way for the construction of large-scale reservoirs, the emergence of a social elite who owned them and a rapid growth in commerce. The economic and social significance of the invention of the sluice, according to Gunawardana, is comparable with inventions such as the heavy, wheeled plough and the stirrup, in European history (Gunawardana 1978; 1985b). By taking a novel approach Gunawardana (2008) used the evolution of irrigation technology and the development of the state to periodize Sri Lankan history. However, the interest of Gunawardana in treating technology as a factor in socio political analysis is confined to the early history of the island.

Another example from the recent past of technology being used as a site for social inquiry, is the study by Wickramasinghe (2014b). She uses Singer sewing machines and other technical items introduced and used during British colonial times to problematise the history constructed through colonial archives and within the colonizer-colonial subject framework. Wickramasinghe describes a complex situation where people, goods and events belong in multiple loops (local, regional and global at the same time) and in heterogeneous time. The colonial state alone does not govern passive colonial subjects constructed by the colonizer. The people too are endowed with agency to forge their own identities and discourses.

The focus of investigations by both Gunawardana and Wickramasinghe is on certain technologies of the past rather than on modern engineering projects and on their relationship with the social. The Accelerated Mahaweli Development Project, designed and implemented in the second half of the twentieth century, is perhaps the only exception so far, as it has been the target of a few scholarly works. Researchers have observed the project through a variety of lenses. While Tennekoon (1988) positioned her discussion within a discourse of rituals of development, Hennayake (2006) formulated a conceptual model of indigenous development to facilitate her discussion. The Accelerated Mahaweli Development Project was also seen as a case of Sinhala colonisation in the thinly populated dry zone of

the island, by scholars such as Peebles (1990). Though positioned in debates on development and colonisation, these studies display some of the ways in which the modern engineering project is used as a site to mobilise Sinhala nationalism.

The scholarly discourse on nationalism in relation to engineering is not as yet adequately established. In the three-and-a-half-decade long debate on nationalism, engineering (in the form of industrialisation) appears within the modernist school as a precondition of nation building. For Gellner, nationalism that could lead to the formation of nations is only possible in modern, large scale, industrial societies (Gellner 1964; Breuilly 2009; Gellner 2009[1983]). For Gellner as well as Hobsbawn, the nation is a product of modernism. The latter situates the origin of a nation at the point of intersection of politics, technology and social transformation and states that nations and their associated phenomena must therefore be analysed in terms of political, technical, administrative, economic and other conditions (Hobsbawm 1990, p.10). Anderson (2006[1983]), too, identifies the modernist context under which new nations originated. "What ... made these new communities imaginable" was the unintentional but "explosive, interaction between a system of production and productive relations (capitalism), a technology of communication (print), and the fatality of human linguistic diversity" (pp.42-43). For him, the cultural origin of the nation was a result of the meeting mainly of two modern developments; the decline of religious communities and the dynastic realm (pp.12-22) and the mass consumption of newspapers (pp.33-36).

It is this rare presence of material conditions in the discourse on nationalism that has made Desai (2008) claim that the most influential accounts of nationalism - from Karl Deutsch to Benedict Anderson - treated nationalism as a cultural phenomenon[6] (p.403). National legitimacy according to this, is anchored in a continuous relationship with the past. The classical discourse on nationalism is hence a discussion that looks towards the past, leaving engineering, a practical art which is more about engineering the future than reconstructing the past, inadequately addressed. This nature of orientation towards the past, seen in general in the discourse on nations and nationalism is reflected in one of the important contributions on science, engineering and nationalism, *National Identity: The Role of Science and Technology*. In the introduction, the editors of the volume, Carol E. Harrison and Anne Johnson (2009), after a brief reference to the recent discourse on nationalism, turn quickly to the famous speech

[6] Desai considers Gellner to be an exception to the trend of treating nationalism as a cultural business. The only other major theory to account for nationalism in terms of political economy was Marxism, according to Desai (Desai 2008, p.403). Tom Nairn who incorporated many of Gellner's insights, replaced industrial society with capitalism when he theorised nationalism and established links with nationalism and capitalism (Ibid, p.403).

"what is a nation" given by Ernest Renan in 1882 to build a case for science, technology and nation. Renan's theorization that nations look backward as well as forward provides the turf required by Harrison and Johnson to bring the involvement of science and engineering into the discussion on nationalism and to position country case studies in context in their volume. In addition to the "glorious heritage" of their past, they need a "shared programme to implement" in a common future, quote Harrison and Johnson (p.3). By contrasting with the title *Invention of Tradition* by Hobsbawm and Ranger (1983) they coined the term "tradition of invention" to denote this role of science and technology in nationalism. Chatzis (2007) seems to be more forthright in identifying the agency of this forward-looking nationalism. He thanks engineers for not allowing to restrict the formation of modern nations and their entry into modernity merely by linking them to some 'happy hazy past', but by binding the formation of modern nations with the promise of a brighter future. Chatzis recommends that scholarship on the nation needs to be as attentive to nations' anticipated futures as to their imagined past (p.194).

An emerging pool of case study based literature which points to a variety of roles played by engineering in mobilising nationalism and constructing nations however, can be found elsewhere, away from the classical debate mentioned above. These scholarly interventions that are diverse in scope and can be positioned within several lines of investigations still remain unconnected and have not yet contributed towards the formulation of a general theoretical base to discuss engineering and nationalism. In comparison to the pool of studies conducted on the history of engineering and on how traditions of modern engineering have been established and how professions of engineering evolved within those traditions and spread over the past decades[7] (Picon 2004), studies that look at the link between engineering and nationalism are works conducted in recent times. While some of these investigations are into modern engineering works (i.e. major technological projects and technologies) and their relationship with the mobilisation of nationalism, the rest more or less focus on the role of engineers (i.e. as eminent engineers, groups of engineers and communities of engineers) in constructing and redefining nations and modern states. These studies represent cases in different parts of the world,

[7] "The Revolt of the Engineers: Social Responsibility and the American Engineering Profession" by Layton (1986[1971]) that examines the evolution of engineering profession in the United States, "New Profession, Old Order : Engineers and German Society, 1815-1914" by Gispen (1989) which discusses the evolution of Verein Deutscher Ingenieure (VDI), the powerful institute of engineers in Germany, and "The Engineers: A history of the Engineering Profession in Britain, 1750-1914" by Buchanan (1989) that describes in detail the origin and the spread of professional institutions of engineers in the United Kingdom can be taken as a few prominent examples. Attempts have also been made to compare these main traditions (Picon (2004) and Brown et al (2009), for example, by covering the time span from the eighteenth to twentieth century AD compare the traditions of engineering in France, Britain, USA and Europe). Investigations have also been done on engineering and engineering education in the peripheral Europe such as in Portugal (Diogo and De Matos 2007), in Spain (Roca-Rosell et al 2006) and in Turkey (Tantekin-Ersolmaz et al 2006) and in other parts of the world such as for example in Bahrain (Al-Sammak and Al-Shehabi 2006) and in Egypt (El-Sayed et al 2006).

from the west to the east, and trace a time span of several hundred years, from the seventeenth to the twenty first centuries.

Nuclear power in France in the twentieth century (Hecht and Callon 2009[1998]), the Palapa satellite in Indonesia in the twentieth century (Barker 2005), the national airplane project in Indonesia in the twentieth century (Amir 2007), water engineering projects in India, Netherlands and the USA in the twentieth century (Bijker 2007), the Port of Lisbon in Portugal in the nineteenth century (Saraiva 2007), water engineering in Vietnam in the twentieth century (Biggs 2008), large lakes in Western Java in Indonesia in the twentieth century (Oosterhout 2008), the Gotthard railway of Switzerland in nineteenth century (Schueler 2008), Barnes Wallis' designs of aircraft and submarines in England in the twentieth century (Zaidi 2008), the steel plant in Cilegon in Indonesia in the twentieth century (Moon 2009), the Canal du Midi in France in the seventeenth century (Mukerji 2009), European converging technologies (Nordmann 2009) and space exploration in Russia, India and China in the twentieth century (Siddiqi 2010) are some of the examples of modern engineering works under investigation. Mrazek (2002), taking a slightly different approach, discusses how the dream of an Indonesian nation is being formed mediated by the introduction of new technologies in general. Engineers in Weimar and Nazi Germany (Herf 1984), engineers and the discourse of Indian developmental nation (Kumar 2000), the role of inter-war engineers in constructing the Greek version of modernism (Antoniou et al 2007), French state engineers in the first half of the nineteenth century and the birth of French technocracy (Belhoste and Chatzis 2007), the changing relationship between the Italian engineering profession and the idea of nation in Italy (Bocquet 2007), national identities of engineers and technical identities of nation states (Chatzis 2007), the role of Mexican engineers in industry oriented nation building (Lucena 2007), French engineers and technocratic ideals of France from the eighteenth to twentieth century (Picon 2007), engineers and Indonesian industrial nationalism (Amir 2008), MIT trained Indian engineers (Bassett 2009), nineteenth century engineers and American national identity (Johnson 2009), German engineers and Russian national identity (Siddiqi 2009) and engineers and the Colombian technological nation (Valderrama et al 2009) are examples of communities of engineers that attracted scholarly attention.

The complex landscape of Sri Lankan engineering mixed with material reality, rhetoric and myth calls for diverse conceptual tools to engage with the research problem. The following three concepts, "developmental nationalism", "invented tradition" and "myths", as I see, provide contexts to position and guide the chapters in this dissertation. The three concepts correspond to the three main chapters of this dissertation, respectively. While “developmental nationalism” assists in facilitating a discussion

on the role of engineering in nationalism with a forward gaze, “invented tradition” and “myths” remain useful tools in discussing other engineering projects that act as sites of mobilising past-oriented ethno-nationalism.

Developmental nationalism

A line of debate that escaped the attention of Harrison and Johnson (2009), but could have provided a theoretical context to position at least some of the case studies in *National Identity: The Role of Science and Technology*, is the discourse on the developmental state. In contrast to ethno-nationalism that in general invokes memories of a past, the debate on the developmental state is about developmental nationalism where imagination of a community is mobilised towards a common future in a technologically developed state.

The term developmental state was in circulation since the 1980s when Chalmers Johnson (1982) paid attention to the process of the emergence of a Japanese nation as an industrial giant. Johnson in his publication "MITI[8] and the Japanese Miracle", dealt in depth with the Japanese state-driven fifty-year long industrialisation process that was coordinated by industrial policies and guided by the Ministry of International Trade and Industry. Woo-Cumings in her edited volume on *Developmental State* (1999) also discusses the centrality of East Asian industrialisation in the early formulation of the theory of developmental nationalism and the developmental state. The discourse that was constructed by looking at economic practices, first in Japan and then in South Korea and Taiwan, frames developmental nationalism as a means to combat Western imperialism and to ensure national survival. By expanding the discourse to South Asia, David Ludden (2005) takes the history of the modern developmental regime to the nineteenth century. For him, four modern developmental ideals that prevailed since the latter part of the nineteenth century made the developmental state possible. The first was the belief that the state would lead the development process on behalf of the public. Second was the trust placed in state funded infrastructure to boost private investment, expand and integrate markets, accelerate economic growth and enrich the state, benefiting the public at large. It was also thought, thirdly, that the poor would also be benefited by the resultant economic progress. And finally, it was believed that the advances in science and technology would lead to human progress in all nations (*Ibid*). In the thesis of Amiya Kumar Bagchi (1982; 1987; 2004), the transition of a society of feudal nature to a society of civic nature which assures the equal political rights of its membership, is displayed as a basic requirement in the formation of a developmental state. By taking the origin of the developmental nation further into

[8] MITI stands for the Ministry of International Trade and Industry, Japan.

the past Bagchi identifies Netherlands (sixteenth century), England (sixteenth to nineteenth century) and Germany (nineteen to twentieth century) as developmental states that predated the developmental state of Japan. He also pays attention to three more developmental states that appeared after the emergence of a Japanese developmental state (arose in the nineteenth century and survived into the late twentieth century) and before the looming of the East Asian states in the late twentieth century; Turkey and Brazil which emerged before the second world war, and India which emerged after its independence in 1947.

Zachariah (2005; 2012) provides the best description of the Indian developmental nation. Indian nationalism mobilised under the leadership of Jawaharlal Nehru looks like the ideal model of a developmental nation - tolerant, secular, inclusive, egalitarian and non-discriminatory. For Zachariah (2005) Indian developmental nationalism was a mixture of three predominant elements: 'socialism', 'national discipline' and 'science' which facilitated the incorporation of modern conceptions of order, progress, reason, science and discipline (pp. 211, 252). While socialism and national discipline set the ground, plans for industrialisation mobilised culturally diverse groups of people who had no common past to share and to imagine as members of a single nation, the Indian developmental nation. The plans of the National Planning Commission of the India Congress, the Plan for Economic Development of India (popularly known as the Bombay Plan) authored by prominent Indian businessmen, and the consecutive five-year development plans of the Indian government defined the nature of the Indian developmental state. Self-sufficiency in general and specifically in basic and key industries was the main guideline for industrialisation plans made separately for heavy key industries, medium scale industries and cottage industries (Zachariah 2005, pp. 216-18). Several prominent scientists, engineers and economists were known to play a leading role in building the Indian developmental state. The names of Meghnad Saha (astrophysicist), P.C. Mahalanobis (physicist turned developmentalist), Jayaprakah Narayan (economist), Minoo Masani (economist), S. S. Bhatnagar (Chemist) and H. J. Bhabha (nuclear physicist) are prominently highlighted (Kumar 2000; Zachariah 2005). Mokshagundam Visvesvaraya who had a long and distinguished career as a civil engineer and a knighthood from the British government and who spent a long spell as Diwan of Mysore state, is one of the pioneers of the imagination of the Nehruvian developmental state of India. Early twentieth century publications by him - *Reconstructing India* (1920), *Unemployment in India: Its Causes and Cure* (1932), *Planned Economy for India* (1936), *Nation Building* (1937) and *Memories of My Working Life* (1951) mapped the early blueprint of the modern Indian Developmental nation (Visvesvaraya 1920; 1932; 1936; 1937 and 1951).

Sakar (2008) adds another dimension to the discourse on developmental nationalism, a discussion which is generally guided by clear-cut categories of cultural and developmental nationalism. While accepting that these categories have relevance and value, Sarkar opts for an approach of treating all nationalism as consisting of both features, cultural and developmental (p. 432). However, one may wonder if this dual nature referred to by Sakar is in fact an important feature of nationalism or whether it is a misconstruction, due to the absence of a well formulated definition of the two terms. The perception that cultural and developmental as categories oppose each other is not exactly correct. Ethno-nationalism would have been the better choice in my opinion, to represent the opposing version of developmental nationalism. Desai (2009) proposes a slightly different approach to discuss this complex nature of nationalism. For her each nationalism has two dimensions: cultural political and political economic (pp. 246-47). The bias of each category of nationalism however, can be towards one of the two dimensions - developmental more towards political economics and cultural more in the direction of cultural politics.

Invented traditions

The discussion of traditions that are invented has introduced a new tool to investigate nationalism at work. Despite their historical novelty as Hobsbawm and Ranger (1983) convincingly argued, invented traditions establish continuity of the present and the future with a suitable past. By 'invented tradition' they mean "a set of practices, normally governed by overtly or tacitly accepted rules and of a ritual or symbolic nature, which seek to inculcate certain values and norms of behaviour by repetition, which automatically implies continuity with the past" (p.1). In answering the question as to why antiquity is relevant, Guibernau (2004) finds the employment of antiquity as a source of legitimacy for a nation binding its members to a past stretching over their life spans and those of their ancestors. Invented tradition is a scheme adopted by the elite who found it increasingly difficult, along with the introduction of mass democracy, to maintain obedience, loyalty and the cooperation of their subjects and members, especially the working class (Hobsbawm and Ranger 1983, pp. 264-65). Hobsbawm and Ranger find three major innovations of the time particularly relevant when it comes to invented traditions: the introduction of primary education (the secular equivalent of the church), the invention of public ceremonies and the mass production of public monuments (p. 271). While differentiating invented traditions from invented customs and convention or routine and from genuine traditions, Hobsbawm and Ranger find invented tradition in three overlapping types: those establishing social cohesion and

collective identities; those legitimating institutions and social hierarchies and those socialising people into particular social contexts (p.9).

The idea that traditions are invented gained global popularity since its initial formulation in 1983 and contributed in improving our understanding in a range of fields from childhood, kinship, self to culture and nations (Sollors 1989). Ranger (1993), interestingly, has somewhat revised the 1983 thoughts he shared with Hobsbawm a decade later. While critiquing his own position on the invention of tradition in colonial Africa where he proposed a clear separation between the pre-colonial and the colonial, Ranger revisited his argument to suggest, reminding us the similar argument forwarded by Sivasundaram (2007) and described above, that "perhaps the elaboration of identities and invention of traditions in pre-colonial India and Africa took place in much the same way and for much the same reasons as in colonial India and Africa". He was also of the opinion that the traditions invented (in colonial times) are not, in general, a smooth passage but a process intensely contested by different groups whose interests are not served by them. It is with the uneasiness with the rigid message communicated by the term 'invented tradition" that the invention is entirely a new creation done by a single inventor at a given moment of time, that Ranger seems to prefer lately, the term "imagination" over the term "invention". He argued that traditions were imagined by many different people and over a long time.

Whether a moment or a process and whether invented or imagined, traditions, help to perform the basic function proposed by Hobsbawm and Ranger (1983); to establish continuity of the present with the past. Rituals, ceremonies and monuments with a technological touch commemorated repeatedly could either create an illusion of a technically advanced past or construct an imaginary bridge between the two islands; past (historical narrative of the nation) and the present (the site of modern engineering). The tradition invented and practiced repeatedly at the site of modern engineering could convert the modern site to a grand monument of the national past, in the minds of the members of a nation.

Myths

The significance of myths in the construction of nations is something that is accepted by most theorists of nationalism across the board, from primordialists to modernists and post-modernists (Ozkirimli 2010, p. 167). Myths take centre stage when a nation is defined, as in the case of Smith (2002), as "a named community possessing an historical territory, shared myths and memories, a common public culture and common laws and customs" (p.15). For some, they play a key role, perhaps even more decisively than

real events, in constructing collective memories of the origin and the golden ages of a nation (Bell 2003, pp.69-70). They remain an integral part of ethno-nationalist identities in the South Asian region in particular. Gunawardana (1976) recommends to historians that they move away from their traditional methodology and pay greater attention to the study of myths as a noteworthy source of information on social and political ideology, when they study the ancient history of South Asia. By focusing on myths of the origin of Sinhala people and of the foundation of their state recorded in the famous religious chronicles of Sinhala Buddhism, Kapferer emphasizes the capacity of these nationalist myths to achieve an overdetermining force by suppressing diversities of socio cultural life such as those connected to class, ethnicity, kinship, etc (Kapferer 2012[1988]). Gunawardana (1976) identifies the hegemonic narrative of Sinhala past, which itself is a myth, as a collection of sub myths linking in different ways the nation of Sinhala with Buddhism. A few years later in his famous article, "The People of the Lion: Sinhala Consciousness" Gunawardana (1985a[1979]) goes on to describe how this myth that has achieved hegemonic status was favoured among a few other myths of origin. According to Coomaraswamy (1986), the counter narrative, - the story of the origin of the Tamils, too is a myth built out of several other elementary myths.

Myths and history are considered antithetical in general. Positivist historiography declares that myth has nothing to do with history; academic mythology replies that history has nothing to do with myth (Heehs 1994). Discussing how history has become the dominant mode of constructing the past, Nandy (1995) identifies the ultimate aim of historians as "to bare the past completely, on the basis of a neatly articulated frame of reference that implicitly involves a degree of demystification or demythologization. The frame of reference is important, for history cannot be done without ordering its data in terms of something like a theme of return (invoking the idea of cultural continuity or recovery), progress (.....), or stages (....)" (pp. 47-48). Nandy, however, observes a change in approach in the recent decades where antagonism between myths and history seems to have compromised. He notes that it is fairly commonplace to say at present that there can be no true or objective past; that there are only competing constructions of the past (p. 49). Some go so far as to view history as a sort of myth (Heehs 1994, p. 5). Sophisticated myths, according to Smith (1999), are poetic forms of history and are "reconstructions of the communal past, which mix genuine scholarship with fantasy, and legend with objectively recorded data in the service of an ethic or regeneration" (p. 66). In contrast to the act of demythologization Nandy talks about when discussing the aim of historians, which is about denying the literal truth of myth, Obeyesekere as far back as 1984 introduced the term “demythicization” to explain

attempts that are made to make fantasies look real. In the process of demythicization, old myths are 'rationalized' by providing 'proofs', observes Obeyesekere (Obeyesekere 1984, pp. 378-79).

Myths, in the context of nations, serve to establish and determine a nation's foundation and system of values, creating a set of beliefs put forward as a narrative about the community itself (Schopflin 1997). In *Myths and Memories of the Nation* Smith (1999) provides a broad framework to discuss and analyse myths. He identifies six components of ethnic myths in relation to nations, depending on the key aspects highlighted: temporal origins (when we were begotten), location and migration (where we came from and how we got here), ancestry (who begot us and how we developed), heroic age (how we were freed and became glorious), regeneration (how we restored the golden age and renewed our community as in the days of old) (pp.62-70). While a main myth constructs a narrative of temporal and spatial origin of the nation, a series of sub myths can be occupied in parallel to explain the existence of other groups, justifying their "anomalous status" and making way to absorb them to the social structure of the nation, argues Obeyesekere (1984)[9]. Obeyesekere (1984) refers also to instances where myths facilitate a state of coexistence of an ethnic group with other ethnic groups. This is done by a myth that positions the other ethnic group as subservient to the main ethnic community[10]. Stories of golden ages and their heroes and sages, a key element of ethnic myths, leave open an easy passage for the members of a nation to return to the past. The future of the ethnic community derives its meaning and shape from the pristine golden age when men were heroes (Smith, p. 65) or grandiose heroes as Obeyesekere (1984) prefers to identify them (p. 376). They rather brought into the open those qualities of courage, wisdom, self-sacrifice, zeal, and stoicism - qualities that are felt to be lacking in the present generation (Smith 1999, p. 86) and boosted the self-esteem of people whose "morale" had sunk low in an era of troubles (Obeyesekere 1984, p. 372)[11]. The significance of myths in constructing a nation and the key role that engineering played in a narrative in constructing the Sinhala nation, suggests interesting links between

[9] In his famous work "The Cult of the Goddess Pattini", Obeyesekere (1984) pays attention to the myth of King Gajabahu who is said to have brought 12,000 Tamil prisoners back from India along with the 12,000 Sinhala prisoners already taken to India. The myth of Gajabahu, a "colonization myth" according to Obeyesekere, explains the existence of South Indian settlers in parts of the Kandyan provinces and coastal regions and "served as a useful mechanism for incorporating immigrant populations into the Sinhala social structure till recent times" (pp. 364-367).

[10] Obeyesekere refers to the case where Muslims in Sri Lanka are tolerated thanks to a sub myth when their god and their system of worship were made subsidiary to the Buddha and Buddhism (Obeyesekere 1984, p. 308).

[11] Smith (1999) goes on to list a several recurrent features of myths: they designate the basic cultural entities of social relations, they link past to future, they possess external referents of comparison, they designate a space and time for action, they contain impulses for collective action, they assume the possibility of change, they are partly voluntaristic and regenerative and they tend to be multiple and even competing to be the legitimate narrative (pp. 82-83).

the two spheres - myths and engineering, allowing engineering as a myth to play an important role in addressing the research questions of this study.

Sources

Conducted at the crossroads of Sri Lankan engineering and Sinhala nationalism, a space mixed with materiality and fiction, this study depends on a variety of sources to build its argument. Texts produced under the British colonial administration and the independent Sri Lankan state are used as sources. These include technical material available in the sphere of engineering and non-technical material found in the popular public space. Also used as sources are a range of other material such as memoirs, reports of public events and processes, biographies and oral histories collected through in-depth interviews. The main archival work was carried out at the National Archives of Sri Lanka, at the library of the Institute of Engineers Sri Lanka and at the library of the Mahaweli Authority of Sri Lanka.

Sessional Papers and Administration Reports, the two main sources of colonial literature, play an important role in investigating the time span of the early twentieth century. Special attention is paid to commission reports on industries and to reports produced by the officials of the Public Works Department (PWD) and its branches and incorporated in the Sessional Papers and Administrative Reports. This dissertation relies heavily on Hansards of the State Council to explore the response of the Ceylonese elite to main infrastructure projects designed and implemented during the first half of the twentieth century. Annual reports of relevant engineering projects and programmes, ad-hoc reports and feasibility reports of related mega engineering projects published by the United Nations as well as by ministries of the Sri Lankan Government are examples of sources produced during the post-colonial period and used for this study. A range of propaganda material developed by the Ministry of Mahaweli Development, such as leaflets and booklets, are also used as sources.

Some of the articles that appeared in annual technical journals published by the Engineering Association of Ceylon and lately by the Institution of Engineers Sri Lanka are used in inspecting tensions between colonial and Ceylonese engineers. A wide range of sources such as newspaper articles, video clips, web articles, popular TV and radio programmes, fiction and semi fiction, commercial advertisements, and books and booklets, mostly in the Sinhala language, are also used in analysing the popular narrative of Sri Lankan engineering, which undergoes modification and revision on a regular basis.

Memoirs pertaining to some of the key mega engineering operations and biographies of prominent Ceylonese engineers, too, provide assistance in dealing with research questions. In addition, the reports

of public events such as meetings and book-launches, some of which appeared in newspapers and others as notes taken by myself, are sources used for this study. In-depth interviews conducted with ex officials of leading engineering institutions in Sri Lanka and also with members of certain artisan castes help in filling gaps and strengthening the credibility of the arguments constructed using other sources.

Structure

In an attempt to address the research problem and specific research questions this dissertation mainly looks at three engineering and engineering related sites; the Aberdeen-Laxapana Hydro Electric Scheme (1900-1936), the Accelerated Mahaweli Development Project (1978-1985) and the discourse that has recently taken shape among the majority Sinhala community on Ravana, the engineer and the mythical king of the epic Ramayanaya, and his technological dynasty (2000-2016)[12]. The Accelerated Mahaweli Development Project (AMDP) was selected on the grounds that it was the largest engineering project ever implemented in the island. Though attempts have already been made to look at the AMDP through other lenses, an explicit focus on engineering and Sinhala nationalism was still missing. There were several reasons for me to select the Aberdeen-Laxapana Hydro Electric Scheme as another site for investigation. It was the largest engineering project discussed and implemented during the early part of the twentieth century. While the AMDP represented the era of post-independence, the Hydro Electric Scheme belongs to the colonial era. Engineer D. J. Wimalasurendra, the main figure behind the Scheme, and his relationship with the Navandanna caste, the community of professionals linked with pre-colonial engineering, made the case even more interesting. The site of Ravana was selected as a response to the unprecedented interest shown by the Sinhalese in Ravana at the time I started my research work in 2013/14. While identifying him as a Sinhala / Hela king who ruled the island of Helas thousands of years ago, newspaper articles, books, TV and radio programmes and websites discussed at length the engineering skills of Ravana and technical advancements of his dynasty. In contrast to the understanding that the narrative of the Sinhalese as a great engineering nation is a construction made at a particular historical moment, nineteenth century colonial Ceylon, these three sites that represent different time spans spreading over a century illustrate that it is an ongoing process involved with reproductions, modifications and revisions, with people and projects included and excluded for convenience. A detailed

[12] At the design stage of the study, I was left with two options to address the research problem; to conduct a case study based investigation by focusing either on detailed life stories of a group of selected engineers or on technological sites on which engineering works were constructed. Engineers or sites that were selected were expected to ideally represent different time periods during the last century. The ground work I did at the initial stages of this study encouraged me to favour technological sites over engineers.

discussion on these three sites is assumed to showcase how and to what degree engineering is linked with Sinhala nationalism. The four research questions do not correspond to four individual chapters of this dissertation, but act as threads common to all, while certain questions guide certain chapters more than others.

Chapter 1 sets the ground for the discussion described above. By paying attention to how some social groups (e.g. engineering academics, engineers attached to professional organisations and the general public) perceive the history of engineering in Sri Lanka, Chapter 1 constructs a static view of the popular narrative of engineering in circulation in the recent past, by allowing subsequent chapters of this dissertation to establish the dynamic nature of the process. It seeks to explore key common features of contemporary narratives of Sri Lankan engineering and how these features forge a relationship between engineering and Sinhala nationalism.

Chapter 2 seeks to explore why the Aberdeen-Laxapana Hydro Electric Scheme, the most important engineering intervention of the first half of the twentieth century, was delayed by decades in construction and commissioning and why the Scheme hardly appears in the narrative of the Sinhalese as a great engineering nation. As a part of the investigation, I have focused on identifying the tensions between the colonial regime and locals from individual to institutional levels and the tensions among the local elite, themselves. The investigation is conducted within the broader context of the socio-political landscape of the island in the first half of the twentieth century on the one hand, and challenges to industrialisation faced by colonies in the Indian subcontinent on the other. Chapter 2 also seeks to find out the degree of spread of the collective imagination of Ceylonese for an industrially advanced Ceylon at the time and, in particular, why as in the case of India, Ceylon failed to become a developmental state.

Chapter 3 looks at the Accelerated Mahaweli Development Project - the largest development project ever implemented in the island, as a technological system that generates multiple meanings to multiple audiences. It explores multiple ways in which the Project responded to post independence ethno-nationalist tensions, both discursively as well as in real material terms, to settle ethno political issues of the time. The discussion of the role of the Accelerated Mahaweli Development Project is conducted in relation to the role of other mega engineering projects in the world, in nation building and nationalism. Chapter 3 seeks to investigate how ethno-nationalist tensions of the time are embedded in the technical design of the Project. Also examined is the role played by engineers as mediators between engineering and the concerns of nationalism.

Chapter 4, by looking at the recent widespread interest in the mythical king Ravana whose engineering skills led to the formation of technologically advanced Lankapura dynasty, examines how a narrative of engineering in the public sphere can be affected by new developments in the arena of nationalism. It also seeks to investigate how a narrative of a technologically better past contributes in revising the narrative of a nation. As a way of justifying the selection of the Ravana surge as a main case study, Chapter 4 attempts to assess the spread of Ravana discourse among the Sinhalese in recent times. While noting the existence of the Ravana story as a folklore among the Sinhalese over centuries, it tries to speculate special conditions under which the Ravana narrative as an alternative, gained an unprecedented level of popularity among the Sinhala community in the recent past - to the extent of posing a threat to the official Vijaya narrative of origin of the Sinhala nation. It seeks to define this Ravana 'moment' of the twenty first century in comparison to the nineteen century 'moment' of Sinhala nationalism, the 'moment' at which the official narrative of the Sinhala nation is said to be constructed.

While examining the multiple levels at which Sri Lankan engineering both as a narrative and as a practice is integrated with Sinhala nationalism, this dissertation attempts to bring together the areas of technology and nationalism that have long been seen as distinct fields of inquiry, into a single space of debate and critique.