

# INJURIES IN THE DPRK

## *The Looming Epidemic*

DR KEE B. PARK, DR RAMON PACHECO PARDO,  
MS ELIANA KIM & MR MAXIMILIAN ERNST



PROGRAM IN GLOBAL SURGERY  
AND SOCIAL CHANGE

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*KF-VUB KOREA CHAIR*

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## AUTHORS

DR KEE B. PARK is a Lecturer on Global Health and Social Medicine in the Program in Global Surgery and Social Change at Harvard Medical School.

DR RAMON PACHECO PARDO is KF-VUB Korea Chair at the Institute for European Studies of Vrije Universiteit Brussel and Reader (Associate Professor) in International Relations at King's College London.

MS ELIANA KIM is a researcher at the Program in Global Surgery and Social Change at Harvard Medical School and an incoming MD candidate at the University of California - San Francisco.

MR MAXIMILIAN ERNST is a researcher and PhD candidate at the KF-VUB Korea Chair at the Institute for European Studies of Vrije Universiteit Brussel.

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### I. INTRODUCTION

In April 2018, a tour bus crash in the DPRK killed 32 Chinese tourists and 4 North Korean workers.<sup>1</sup> One day after the accident, Chairman Kim Jong-un was seen visiting the Chinese embassy to express his “deepest condolences and apologies” for the Chinese casualties. The North Korean leader even visited the injured at the hospital, talking to patients at their bedside and holding their hands as he posed for photos that were widely circulated. Due to these prompt, diplomatic displays, this tragic accident garnered much attention from the international community.

This was certainly not the first catastrophic accident leaving many dead and injured in the DPRK though. Recently, another fatal accident occurred when a Chinese tourist fell from a balcony of the Sosan hotel in Pyongyang in April 2019.<sup>2</sup> Last year, about 200 North Korean workers were reportedly killed when a tunnel being dug at the Punggyeri nuclear test site collapsed.<sup>3</sup> In 2016, a high-rise building on Ryomyong street – a new prestigious residential complex in Pyongyang – collapsed while being dismantled by construction workers.<sup>4</sup> Casualties were not officially reported but it was speculated that most of the workers died. A similar accident in North Hamgyong Province in 2015 killed young students living in a five-story building.<sup>5</sup> In 2014, a 23-story apartment building that housed 92 families collapsed, with fatalities reported as “significant” by the DPRK government.<sup>6</sup>

Mass casualty incidents such as building collapses and bus crashes could also be just the tip of the iceberg when it comes to the injury burden in the DPRK – only the worst cases of injury are highlighted in the media. Over 4.8 million people in the world die every year from injuries; it is one of the leading causes of death and disability in the world, most of which occur in low- and middle-income countries.<sup>7</sup> It is hard to imagine that the DPRK, a low-income country, would be an exception. Furthermore, current economic and geopolitical developments within and surrounding the DPRK point towards more future activity in sectors such as construction, traffic, and tourism. Thus, it is not unreasonable to anticipate a surge in accidents and injuries inside the DPRK.

In this context, it is necessary to understand the North Korean healthcare system and its needs to be able to deal with the current and anticipated injury burden. After the tour bus crash in April 2018, for example, a full account of the accident was never disclosed and many questions were left unanswered, especially regarding the immediate aftermath and management of the accident: Was there an emergency response? When and how did the injured people get medical care? Were any of the deaths preventable?

The government of the DPRK seems to believe that these and other deaths from injury should be avoided. Its latest Medium Term Plan for Development of the Health Sector in 2016-20, prioritizes the development of trauma care capacity. Existing financing models in other areas of the healthcare sector shows a willingness to co-finance together with third parties, such as the World Health Organization (WHO) or UNICEF. Even under the current political context defined by stringent sanctions on the DPRK, cooperation between the international community and its government should be possible. After all, the sanctions regime explicitly excludes humanitarian assistance.

In this study, we seek to assess the current burden of traumatic injuries in the DPRK and analyze the injury care capacity in place to manage them. Furthermore, we also estimate the projected surge in injuries in the DPRK and its economic consequences in the near future. Finally, we propose a road map for multilateral assistance for strengthening the injury care system in the DPRK.

## 2. CURRENT INJURY BURDEN IN THE DPRK

According to the WHO, injuries are the fourth leading cause of death in the DPRK, killing about 15,600 people every year (Figure 1).<sup>8</sup> Injuries are by far the biggest killer among the youth and the working age – accounting for more than half of all premature deaths in ages 5 to 29 – while newborns are mainly affected by communicable and infectious diseases, and the older population by non-communicable diseases such as cardiovascular disease and cancer (Figure 2). Furthermore, youth mortality from injuries has steadily increased over the past two decades, while the burden of communicable, maternal, perinatal and nutritional conditions have been mitigated significantly over time (Figure 3).

Figure 1. Top Ten Causes of Death in the DPRK [Data Source: WHO]

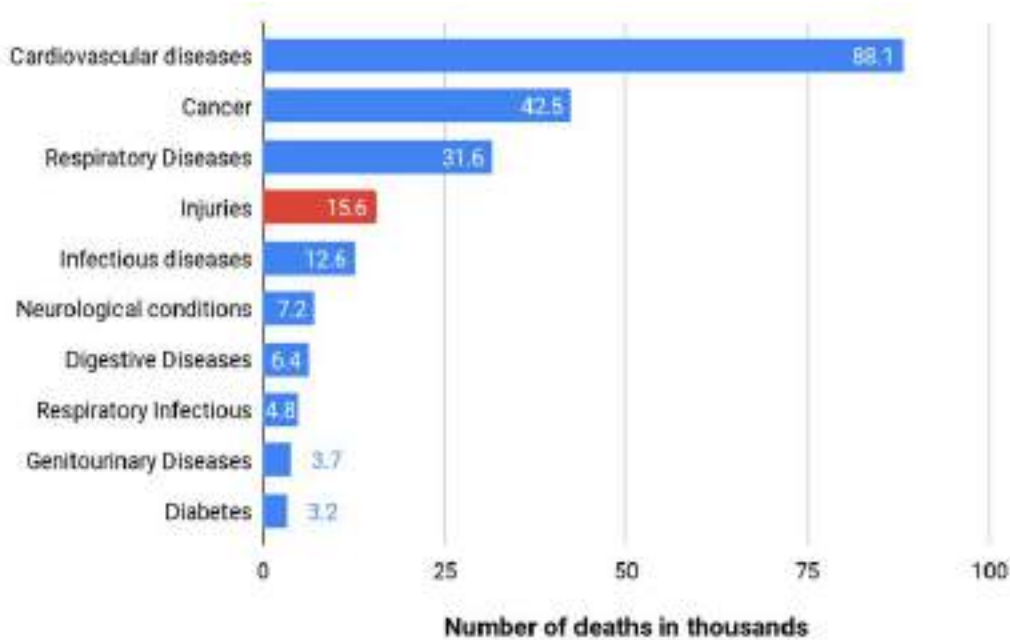
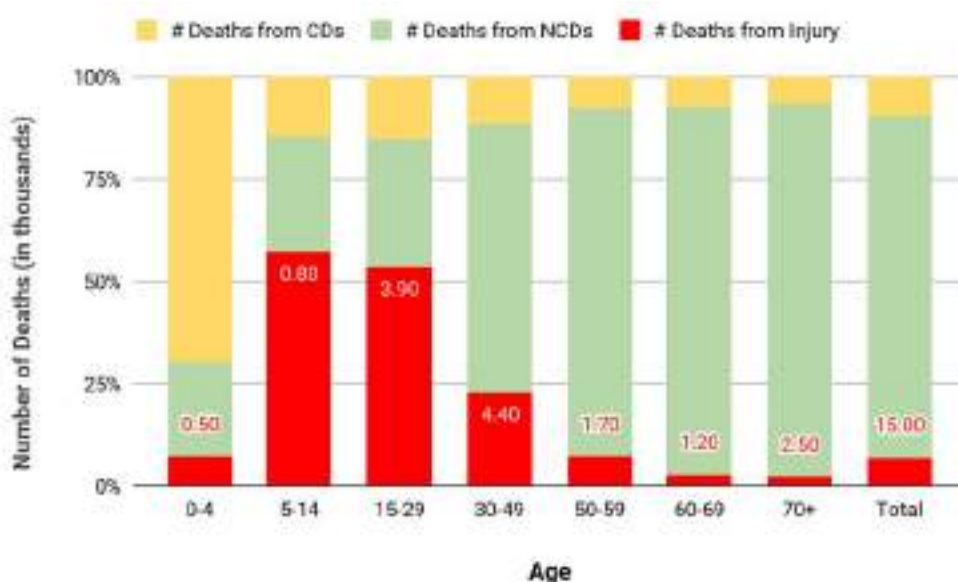


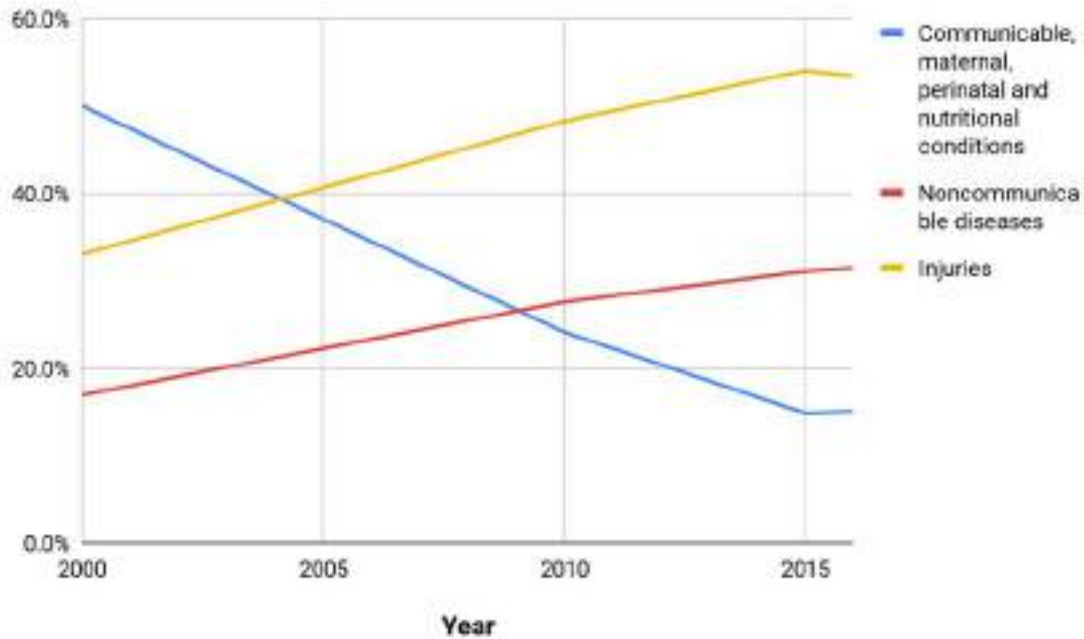
Figure 2. Causes of Death in the DPRK by Age [Data Source: WHO]





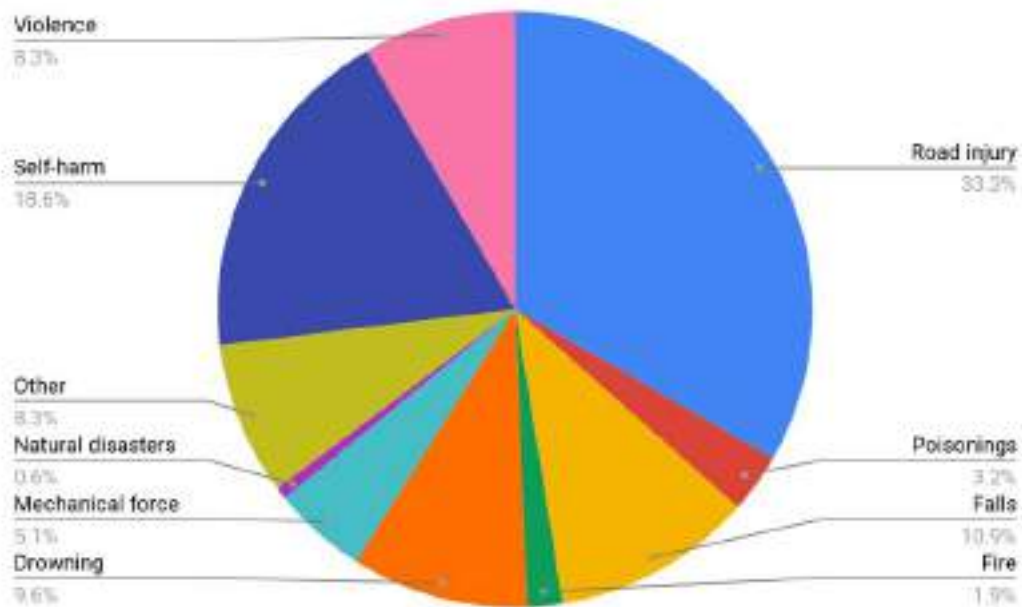
## INJURIES IN THE DPRK: THE LOOMING EPIDEMIC

Figure 3. Mortality in the DPRK in Ages 14-29, 2000-16 [Data Source: WHO]



Road traffic injuries (RTIs) are the predominant cause of fatal injury, representing 33.3% of all injury mortality (Figure 5). In fact, the total burden of disease from RTIs, counting both years of life lost as well as years living with disability, is estimated to be significantly higher in the DPRK than the average across all low and middle-income countries.<sup>9</sup> Fatal occupational injuries are also common, as indicated by mortality due to falls (10.9%) and mechanical force (5.1%), which can be attributed to manual, physical labor such as construction work or mining. Occupational injuries were also among the top ten risk factors driving the most cases of death and disability combined in the DPRK.

Figure 4. Mechanism of Injury Deaths [Data Source: WHO]



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It should be noted that the data presented are the disease burden and mortality estimates from the WHO. The data is partially modeled based on regional trends and demographic and socioeconomic indicators using methodology developed by the Institute for Health Metrics and Evaluation.<sup>10</sup>

In summary, this data provides a likely picture of the overall injury burden in the DPRK. Critically, it sheds light on three alarming patterns of injury as a public health concern in the DPRK: firstly, it predominantly affects young people; secondly, it kills more people every year; and thirdly, road traffic and occupational accidents are the most prevalent causes.

### 3. CURRENT INJURY CARE CAPACITY IN THE DPRK

With the alarming trends of injury in the DPRK, it is important to evaluate the current status of the North Korean healthcare system and its capacity in dealing with cases of trauma. A full spectrum of injury care includes medical care and treatments provided within the hospital setting, pre-hospital care and continued rehabilitation post-clinical management. This demands a wide variety of resources, properly trained staff, equipped medical facilities that are accessible, and adequate infrastructure to support all of the above. But does the DPRK health system satisfy these critical components of injury care? We sought to understand how people with acute injuries are typically managed in the DPRK and what type of medical care is available to these patients at every step from the event of a traumatic accident to recovery.

We researched the international medical literature as well as grey literature on the healthcare system in the DPRK and its capacity for injury care. Due to the lack of available empirical data on the management of traumatic injury patients in DPRK, we also gathered anecdotal evidence from those who have directly experienced the country's injury care system. Through a standardized survey distributed to former residents of the DPRK, as well as humanitarian aid workers, NGO representatives and tour operators who often or regularly travel to the DPRK, we inquired into any event of injury that occurred during their stay in the DPRK and the specific medical attention and services received. In addition, we interviewed medical professionals and UN officials who have worked extensively with the health system in-country and therefore have insight into its operation.

A total of 21 informants participated in the survey. 19 of them were former residents of the DPRK and two were foreign visitors. 12 informants had personally been injured in the DPRK and the rest had indirect experience as observers, having known or accompanied an injured person in the DPRK. In addition, we conducted 12 interviews with medical and UN professionals, NGO representatives, aid workers, tour operators and experts who are or have been residents of the DPRK, travel there regularly and/or conduct research on its healthcare system.

#### 3.1. MECHANISM OF INJURY

The majority (64%) of the reported injuries were due to occupational accidents such as falls or blunt mechanical force. The second most common cause were road traffic injuries (21%), nearly all of which occurred inside Pyongyang. Interpersonal violence-related injuries were also reported (14%). The overall prevalence of occupational injuries and road traffic injuries is consistent with the WHO estimates described in the previous section; however, the proportion of road traffic accidents reported is lower than anticipated. This could be partly explained by the fact that most of the respondents of the survey were former DPRK residents from rural regions of the country, where road traffic accidents might be less prevalent due to lower traffic volumes.



### 3.2. ACCESS TO HOSPITAL CARE

Due to the predominantly rural population of former DPRK residents represented in our sample, injuries reported had also occurred most commonly in rural settings and peripheral provinces. Only one former resident reported being injured in Pyongyang and receiving care at a national university hospital in the city. Among the other respondents, more than half (53.3%) sought medical care at county-level hospitals. Most of the injury patients arrived at the nearby medical facility via their own or their household's means of transportation, such as via bicycle or cart dragged by cows. Others used public transportation or walked, if the (non-)severity of the injury allowed them to do so. It took most people more than one hour to reach the hospital, sometimes even two or three hours.

None of the injured patients received any form of professional pre-hospital care. Another striking finding was that a significant proportion - more than 30% - of the former DPRK residents reporting injuries did not seek any hospital care at all. A common reason was the distance to the hospital and a lack of any means of transportation to get there. Interviews also revealed a general attitude of inaction and helplessness in the face of medical emergencies; many of the respondents simply did not consider seeking hospital care a reliable or productive option and instead opted for home care, traditional medicine, or non-medical healers in the community. Some also noted that depending on the region, phone numbers for emergency medical services were not well known.

Differently, among the foreign respondents to the survey, or those who reportedly experienced a physical accident during one of their visits to the DPRK, injury events occurred inside Pyongyang and hospital care was actively and promptly sought by the injured person or the accompanying team members and local guides. However, even in Pyongyang, medicalized pre-hospital transportation was not available. Interviewed tour operators recounted that medicalized transportation has never been available for their clients, even in cases of dire emergency. Other foreign survey respondents and interviewees also indicated that they may have seen a few ambulances parked in a hospital complex, but they were told by local guides that calling an ambulance was not an option in the event of injury. Instead, injured patients were transported to a nearby hospital in a private car or the tour bus.

### 3.3. MEDICAL FACILITIES, SERVICE AND RESOURCES

More than 60% of the county-level hospitals where the respondents went for injury care had electricity and a supply of intravenous fluids. Ultrasound and crutches were available at roughly a third of these hospitals. Other equipment and resources useful for injury care, such as X-rays, computed tomography (CT) scans, emergency rooms, elevators and wheelchairs, were not available in most of the medical facilities. Although hospitals in Pyongyang were better equipped in general, not all hospitals had basic necessities for injury care. In fact, one of the interviewees recalled that upon arrival to a large hospital in Pyongyang, the emergency room was located above ground level, the elevator was out of service due to a power outage, and no gurneys were available.

The most common type of medical care received was wound care. Surgery was rarely performed on injured patients, although our data only represents survivors of injury and thus may reflect selection bias. Any referrals between hospitals were not reported in our sample. Interestingly, the majority of surveyed former North Korean residents cited the free universal healthcare as the greatest advantage of the North Korean health system. However, since drugs were not always available at medical facilities, most had to acquire them at the local market (*jangmadang*).

### 3.4. SUMMARY

According to surveyed informants and interviewees, it is clear that significant infrastructural barriers to trauma care delivery exist in the DPRK. The survey results indicate that the lack of medicalized prehospital transportation is a serious issue that limits timely access to health services for the injured, even in large cities such as Pyongyang. This finding is supported by a recent UN report, which states that there is a severe shortage of ambulances in the DPRK.<sup>11</sup> It is also supported by other sources indicating that only a few hospitals in large cities such as Pyongyang have ambulances, but that they are rarely used due to fuel shortages.<sup>12</sup>

Other systemic deficits that further complicate the provision of proper injury care have also been highlighted by the survey. Our results indicate that shortages in electricity, equipment and medical supplies critical to injury care are not uncommon. This is in line with the 2019 DPRK Needs and Assistance Report published by the UN, which states that basic hospital functions are routinely interrupted by the lack of electricity and heating systems, and that inadequate water sanitation also seriously undermines medical care.<sup>13</sup> Moreover, according to Nagi Shafik, the former project manager for the WHO's Pyongyang office who has expert insight into the DPRK medical system and who was interviewed for this project, emergency rooms in most hospitals lack many basic medicine and consumables. Furthermore, most county-level hospitals do not have adequate anesthesia services thereby limiting surgical care.

## 4. FACTORS EXPECTED TO INCREASE THE INJURY BURDEN IN THE DPRK

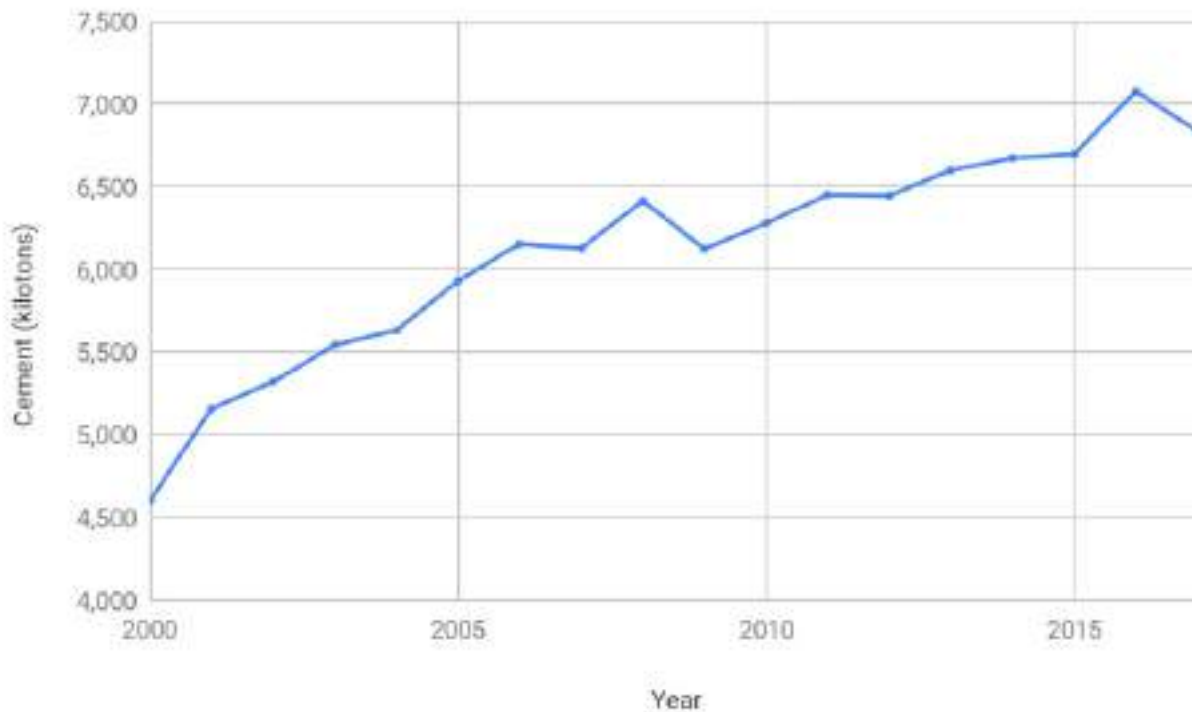
This section will analyze three sectors that can be expected to contribute to an increased injury burden in the DPRK going forward. They are construction, tourism, and traffic. We present an analysis of activities pertaining to these sectors as well as quantifiable data and model projections. In addition, we will provide a summary of recent and near-future multinational infrastructure and industrial projects and how they could add to the injury burden. The projections will, in the case of tourism and traffic, be partly based on data from Myanmar. The case of Myanmar's opening up in the year 2010 has been chosen as it is the most recent example of a previously isolated and heavily sanctioned country following this path. The case for Myanmar as a model that can inform the future of the DPRK is not new and has been established by academic and expert literature.<sup>14,15</sup> Since the reforms initiated in 2010, Myanmar's economy has been growing about 8% year-on-year. While significant obstacles lie ahead of the government in Naypyidaw, the post-2011 reforms have led to increasing trade, investment and economic integration with neighbouring countries and the global economy.<sup>16</sup> Last but not least, Myanmar is chosen as a model for the DPRK because this report uses satellite data of traffic as a proxy for expected road accidents. Other potential cases of previously isolationist countries that opened up, such as China or Vietnam, date back to a time when remote sensing was not yet developed enough to undertake geospatial analysis in the way this report does, i.e. high frequency of observations and high resolution to identify vehicles.

## 4.1. CONSTRUCTION BOOM

Recently, the DPRK has placed an unprecedented emphasis on economic development, in pursuit of the *Byungjin* policy that aims to simultaneously strengthen both the nation’s military and economy.<sup>17</sup> The government’s agenda for economic reform has clearly been manifested in the surge in construction activity. With new skyscrapers emerging every year since 2012, it is not an understatement to say that the Pyongyang skyline has been transformed in recent years. In spite of sanctions and external pressure imposed on the DPRK, residential neighborhoods with high-rise apartments, recreational facilities, and tall public buildings – estimated to be worth over a billion US dollars – have already been completed and more are underway in the capital city, boasting its new nickname “Pyonghattan”.<sup>18</sup>

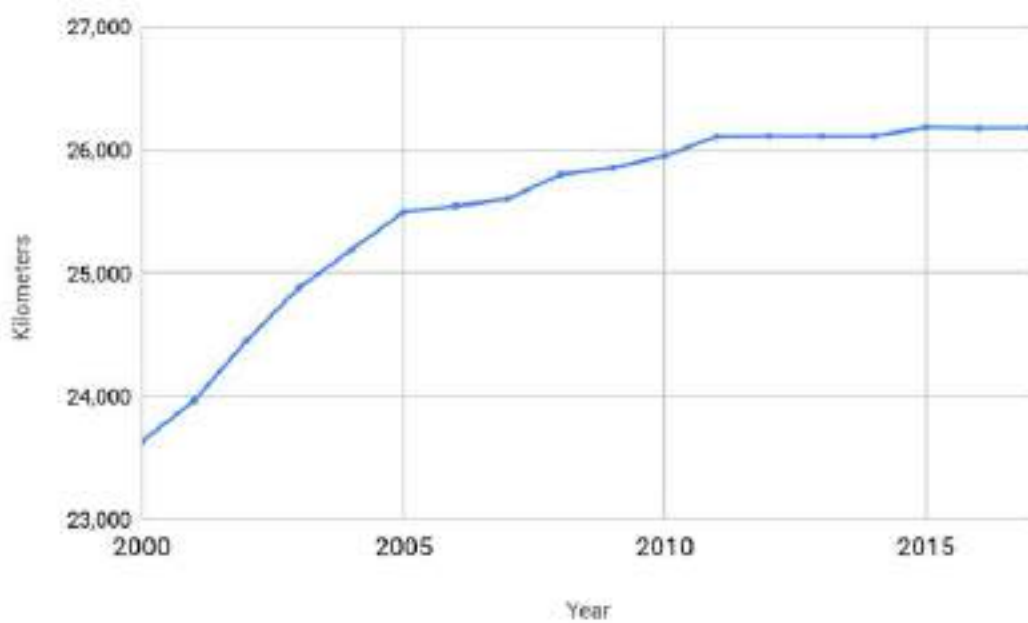
Economic analyses by the Bank of Korea and the ROK Statistics Bureau indicate that the construction industry in the DPRK has experienced consistent growth in recent years: by 1.4% in 2014, 4.8% in 2015 and 1.2% in 2016.<sup>19,20</sup> Another quantitative measure of increase in construction activity in the DPRK is the production rate of building materials in the country. Cement and steel production has steadily climbed in recent years (Figure 5). Notably, cement production has increased by nearly one million tons recently, which parallels the visible increase in new buildings in Pyongyang for example. Not only buildings, but more roads are also being built as part of the construction boom and economic development plan in the DPRK. Data shows that the total distance, in kilometers, of all roads in the country has indeed increased over time (Figure 6).<sup>21</sup>

Figure 5. Total Cement Production (Kilotons) in the DPRK, 2000-17



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Figure 6. Total Road Length (Kilometers) in the DPRK, 2000-17



Increase in construction projects over time can also be directly observed through satellite imaging, which indeed reveal large-scale construction activities in Pyongyang.<sup>22</sup> A large area near Ryomyong Street and the Kim Il Sung University can be seen with building bases and scaffolding in photos from 2017 (Figure 7). Numerous high-rise buildings are visible on Ryomyong Complex, a massive real estate project in which hundreds of high-rise buildings were ordered to be built in just one year's time to showcase the efficiency of the government. In fact, over 50 new buildings were built in little over a year (Figure 8).

Figure 7. Construction Zone near Ryomyong Street [Source: NK News]





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Figure 8. Close-up of Construction Site [Source: NK News]



The regime has also undertaken numerous other construction projects besides the Ryomyong Complex. In 2012, the Changjon Street opened. This is a prestigious residential area where the construction of three 47-story buildings and 15 other high-rise buildings were completed in less than a year.<sup>23</sup> In 2015, 2,500 new apartments were finished on the Mirae Scientists' Street.<sup>24</sup> Public buildings and cultural complexes have also been completed over recent years, including the Mansudae People's Theater, Pyongyang Sci-Tech Complex, Munsu Water Park, and Sunan Airport.<sup>25</sup>

Figure 9. Sinuiju High-Rise Building [Source: NK News]



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Construction is also booming in other places such as the border city of Sinuiju, opposite the Chinese city of Dandong. The following is a partial list of major construction projects that have been completed or are underway, in chronological order:

- Changjon Street (2012)
- Unjong Cutting-Edge Technological Development Zone (2014)
- Mirae Scientists' Street (2015)
- Chongchongang Power Station in Tiers (2015)
- Jangchon Vegetable Cooperative Farm (2015)
- South Hamgyong Sci-Tech Library (2016)
- Ryomyong Street (2017)
- Satellite (Wisong) Scientists Street (2018)
- Wonsan-Kalma Tourism Complex (2018)
- Sinuiju International Economic Zone (2018)

One of the high-rise construction sites in Sinuiju recently caught the media's attention. According to reports, the construction equipment observable from the other side of the river hints at substandard construction conditions, including the use of rudimentary scaffolding to support the concrete structure.<sup>26</sup> It is likely that most other buildings that recently emerged in Pyongyang and other cities also did not follow rigorous standards throughout the construction process.

These are valid concerns in the context of injury burden, if we consider the fact that many construction projects carried out in the DPRK have been plagued by both minor and major accidents such as falls, cave-ins and collapses. In response, the government made a public promise to bolster the safety and security measures in the aftermath of the monumental collapse of a brand new 23-story apartment tower in 2014.<sup>27</sup>

That construction injuries are more frequent in developing countries is well-known, and the DPRK is no exception. As the DPRK prioritizes economic development, investment in infrastructure is expected to increase even more. While improving safety standards for construction workers is essential, the capacity to manage the injured will need to be improved to further reduce mortality and disability.

### PROJECTIONS USING THE MYANMAR MODEL

We will now examine the construction boom in Myanmar post-2010 to derive basic trends and developments that may serve to inform projections of increased construction activity in the DPRK in a post-opening up scenario. Based on calculations by the government of Myanmar in cooperation with the Japan International Cooperation Agency (JICA) in 2014, the country needed investment in infrastructure of about US\$28.5 bn, including roads (US\$12.5 bn), railways (US\$7 bn), seaports (US\$5 bn), aviation (US\$2.5 bn) and inland water projects (US\$1.5 bn) over a ten-year period.<sup>28</sup>

As of 2013, Myanmar's road network was estimated at 148,000 km, of which 79% was unpaved. In the years 2013 to 2015, Myanmar created a plan in cooperation with the Korea International Cooperation Agency (KOICA) and a consortium of South Korean engineering firms which envisioned 34,000 km additional expressways to be built by 2035. Despite these efforts and steps in that direction, the Asian Development Bank (ADB) calculates additional needs of infrastructure investment of US\$60-80 bn over the next 15 years. The costs of insufficient past investment are high: to date, about 20 million people in Myanmar have no basic road access. Furthermore, about 60% of highways and most railways need maintenance.<sup>29</sup>

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New highways are reported to have significant economic benefits for the country. On new as well as repaired streets, the average speed is 80 km/h, instead of only 30 km/h previously. This is of importance also for the highways that connect Myanmar to its trading partners, such as Thailand. After the street from Kawkaeik to Myawaddy was upgraded in September 2015, imports from Thailand increased by 40%. Furthermore, additional transnational road projects are underway connecting Mandalay with China and India, effectively giving the economy of Myanmar access to half of the world's population by road. Noteworthy infrastructure projects include the following:<sup>30,31</sup>

- Yangon-Mandalay Expressway: expansion and repair of the existing road, 620 km (finished in 2017)
- Second Thai-Myanmar Friendship Bridge: linking Mae Sot and Myawaddy over the Moei River (construction began in 2015)
- Railway from deep sea port Kyaukphyu to Muse on the Chinese border (about 1,000 km)
- Railway connecting India with Sagaing in Myanmar, for which the ADB offered US\$ 2 bn in investment
- New Hanthawaddy International Airport, 77km away from Yangon, to be developed by Changi Airport Group from Singapore and the JGC Corporation from Japan; costs of about US\$2 bn (completion expected by 2022)

As this analysis shows, construction, most importantly of infrastructure, increased significantly after 2010. The need for investment in infrastructure, both upgrading old roads and railways as well as construction of new ones, adds up to at least US\$80 bn in the coming decade. This would translate into the upgrading of 117,000 km of roads, construction of an additional 35,000 km, as well as key railway and airport projects.

## 4.2. TOURISM BOOM

The construction boom in the DPRK has come together with a remarkable growth of the tourism sector in recent years. Along with the aforementioned multi-million dollar building projects, tourism can generate hard currency and thereby help the economy.<sup>32</sup> The government's commitment to boosting the tourism industry has been clearly demonstrated by new developments and projects designed to attract more tourists. New hotels, resorts, various entertainment facilities, and even a new airport terminal have appeared.<sup>33</sup> The government also established the Pyongyang Tourism College in 2014 and launched training facilities to generate professional tour guides equipped with specific sets of skills, an ambitious undertaking aimed at systematically expanding the tourism sector of the country.<sup>34</sup>

Early in 2018, the government announced plans for a monumental tourist complex in the Wonsan-Kalma coast. It has actively urged citizens to support the initiative, as seen in propaganda posters (Figure 10).<sup>35</sup> Satellite images of the coast throughout 2018 show that at least 170 new high-rise buildings plus an artificial lake are being built at a breakneck speed over a construction area stretching more than 4.5 km in length.<sup>36</sup> The Wonsan-Kalma complex is deemed the most ambitious tourism construction project that the DPRK has ever launched. In addition, during his New Year's Speech in January 2019, Kim Jong-un expressed his intent to revitalize the Mt. Kumgang area, a wildly popular site that attracted hundreds of thousands of South Korean and Chinese tourists before it closed in 2011.<sup>37</sup>



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Figure 10. North Korean Poster Urging Citizens to Support the Construction of the Wonsan-Kalma Tourism Complex [Source: Korean Central News Agency]



Figure 11. Active Construction Sites in the Wonsan-Kalma Tourism Complex [Source: NK News]





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The World Tourism Organization (UNWTO) does not have data of tourist traffic in the DPRK, but many reports suggest that there has been a significant tourism boom in recent years. It is estimated that roughly 100,000 tourists visited the country in 2018, of which about 80% - or ca. 80,000 - were Chinese tourists.<sup>38</sup> If we compare this number to a 2012 estimate that ca. 50-60,000 Chinese tourists visited the DPRK that year<sup>39</sup>, there clearly seems to have been a drastic increase in tourist traffic to the country. According to anecdotal evidence, recent developments on the Korean Peninsula have also caused an influx of tourists especially from China and Russia, to the extent that the government plans to restrict the number of visitors to 1,000 per day.<sup>40,41</sup> Also anecdotally, NGO workers regularly visiting the DPRK report that it is becoming increasingly difficult to book airline tickets to go in and out of the country.

Another example is the 2019 annual Pyongyang marathon, in which twice as many foreigners participated compared to the previous year. According to Koryo Tours, 950 Western tourists attended the event, compared to 450 in 2018. This indicates that the gradual normalization of the DPRK's relations with the rest world has directly translated into increasing tourist numbers.<sup>42</sup> Moreover, in March 2019 Chinese cruise ship operator Bohai Ferry Group signed a letter of intent for cooperation on the development of ferry routes between China and the DPRK.<sup>43</sup> This is a substantial development that would open even more channels for visitors from China, the largest market for the North Korean tourism industry. As suggested by these recent developments the DPRK could meet its goal of welcoming two million tourists by 2020.<sup>44</sup>

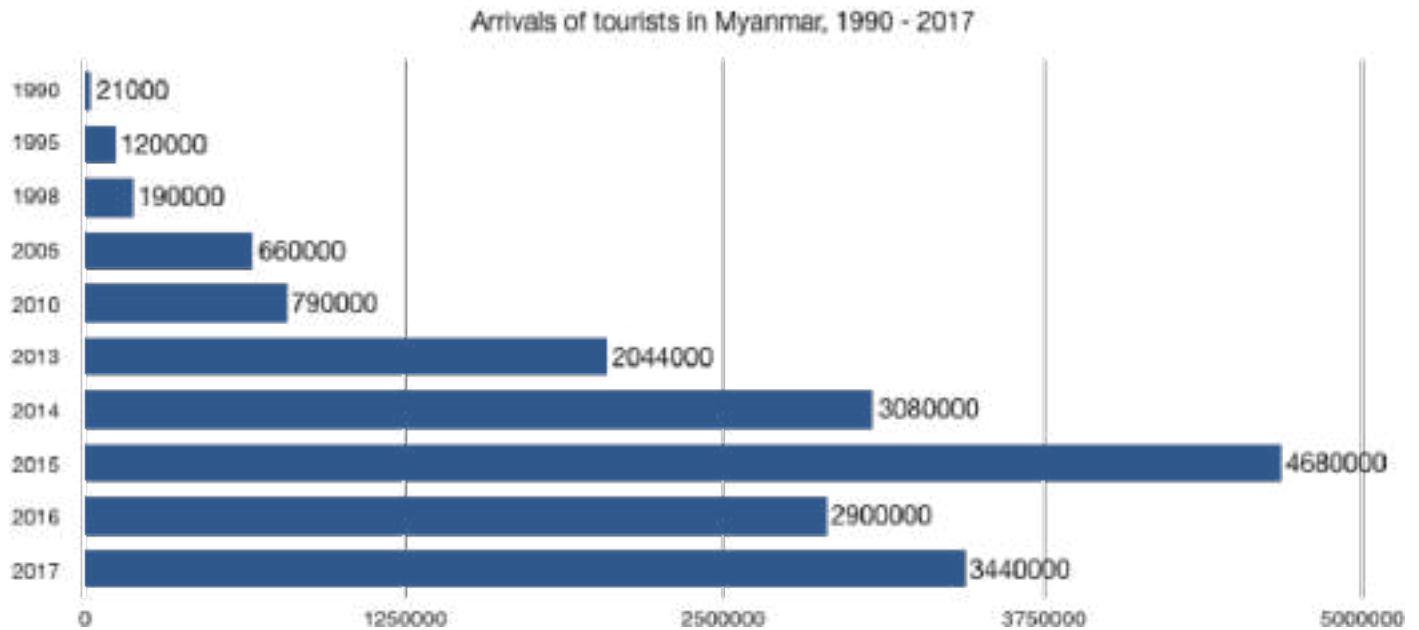
The increase in foreign tourists and the injuries associated with more visits will undoubtedly test the DPRK's ability to provide medical care when needed. Unless the DPRK invests in strengthening injury care services, the enthusiasm for travel to the DPRK could wane. This seems not to have been the case yet. But negative perceptions of the DPRK as a tourism destination due to its inability to provide adequate injury care is bound to have a negative effect on tourist numbers.

## PROJECTIONS USING THE MYANMAR MODEL

It is not surprising that Myanmar's economic opening up was followed by increasing numbers of tourists visiting the country. The tourism industry was a government focus even before the opening up as it represents a source of foreign currency.<sup>45</sup> Already in the 1990s and early 2000s, the number of arrivals went up from 21,000 in 1990 to 190,000 in 1998 to 790,000 in 2010 - an increase of 3,662% over 20 years. Post-opening up in 2010, the number of arrivals rose by 492% in the first five years to 4.68 million.<sup>46</sup> However, in 2016, due to a backlash as a result of the Rohingya refugee crisis, numbers dropped significantly to 2.9 million. They went up again to 3.44 million in 2017, even though this was still over one million less than in 2015.<sup>47,48</sup>

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Figure 12: Tourist Arrivals in Myanmar, 1990-2017 [Source: UNWTO]



In response, the government in Naypyitaw is relaxing visa restrictions and offering visas upon arrival for nationals of a growing number of East Asian countries. After all, tourism has become a key source of income for Myanmar. Revenues from tourism have increased dramatically over recent years and amounted to US\$1.97 bn in 2017 (2.84% of GDP), compared to only 254 million in 2010 - an increase of 675%. Proof of the overall optimistic outlook for Myanmar's tourism sector in the middle term is foreign direct investment by overseas investors and international tourism brands. Notable stakeholders include POSCO-Daewoo from the ROK, the Hoang Anh Gia Lai Group from Vietnam and Keppel Corporation from Singapore, to name but a few companies that have invested in landmark hotel projects, mostly in Yangon.<sup>49</sup>

For the tourism industry as a whole to further develop, it is essential that the above-mentioned needs in infrastructure investment and development are met. In her opening address to a central committee meeting for national tourism development, State Counsellor Aung San Suu Kyi called for a modernised transportation system to attract more tourists. With an improved land transport system, the options for sightseeing would increase and travel would be more convenient. In addition to the overall increased attractiveness of Myanmar as a tourist destination, investments in infrastructure could also curb the cost of domestic transportation and increase efficiency and the value of tour products. According to the Myanmar Tourist Foundation, travel in the country is in fact relatively expensive compared to other Southeast Asian countries. So far, tourism has thrived as Myanmar is seen an "exotic" location for tourists, since its opening up is only a few years old. But for the Myanmar tourist sector to become sustainable and continue to grow in the future, tourism infrastructure and prices have to become competitive with the rest of East Asia.<sup>50</sup>

The case of Myanmar's tourism sector allows to draw some parallels with the DPRK. Myanmar's tourism sector was already growing before the country's opening up. After the opening up, tourism grew exponentially. Similarly, the DPRK is currently actively developing its tourism industry, as shown above. In Myanmar, the number of international arrivals increased by 492% in only five years after the opening up, which is a year-on-year increase of 42.7%, and many international investors

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poured money into hotels and resorts. It is likely that tourism and investment flows into the DPRK will mirror those of Myanmar as the country gradually opens up to the world. As already indicated, as of 2017 tourism made up 2.84% of Myanmar's GDP. But the case of Myanmar illustrates that tourism numbers are highly influenced by the political situation of a country as well as its perception abroad, which will likely also play a role in the ability of the DPRK to attract tourists in the years to come. In this sense, a positive international image is paramount. An underdeveloped system for the care of the injured would pose a limit to the potential growth of tourism.

### 4.3. ROAD TRAFFIC INCREASE

Similarly to construction and tourism, road traffic already is another major source of injuries in the DPRK. In addition, road traffic is expected to increase in the coming years, as the country gradually seeks to open up to foreign investment and become integrated into Northeast Asia's thriving economy. In this section, we present data on traffic developments in the DPRK between 2000 and 2018 collected through remote sensing. We then use road traffic development data as well as data on road traffic injuries in Myanmar in the years before and after the country's opening up to predict the expected increase in traffic in the DPRK in a post-opening up scenario.

#### SATELLITE IMAGING DATA ANALYSIS OF TRAFFIC IN THE DPRK

As established above, RTIs are the predominant cause of fatal injury in the DPRK, representing 33.3% of all injury mortality. This is supported by anecdotal evidence collected during interviews with former DPRK residents and visitors to the country, who confirm that the condition of roads and maintenance level of vehicles could be improved, and that driving under the influence of alcohol is not uncommon. It can be posited that under the current situation an increase in traffic would correlate with an increase in injuries. Therefore, knowledge of traffic developments over time would be matched by developments in the DPRK's trauma treatment burden. Since reliable quantifiable data on traffic in the DPRK is non-existent, this report resorted to remote-sensing to assess the development of traffic density in the DPRK over the past 18 years.<sup>51</sup> Two streets and one parking place in Pyongyang, as well as one street in Hamhung and Rason were chosen.

In Pyongyang, Seungri Street, Yanggak Bridge, and the parking lot in front of Haebangsan Hotel and Rodong Shinmun were observed. Outside of Pyongyang the National Route 7 going through Hamhung and Rason was observed. The time of all observations was set at 11am DPRK time, which allowed for internal consistency of the collected data. A snapshot of each observed area is provided below as an example. When there was an observation, but the visibility did not allow for a quantifiable assessment of traffic, due to weather conditions, no entry was made, which explains the gaps in some of the graphs.

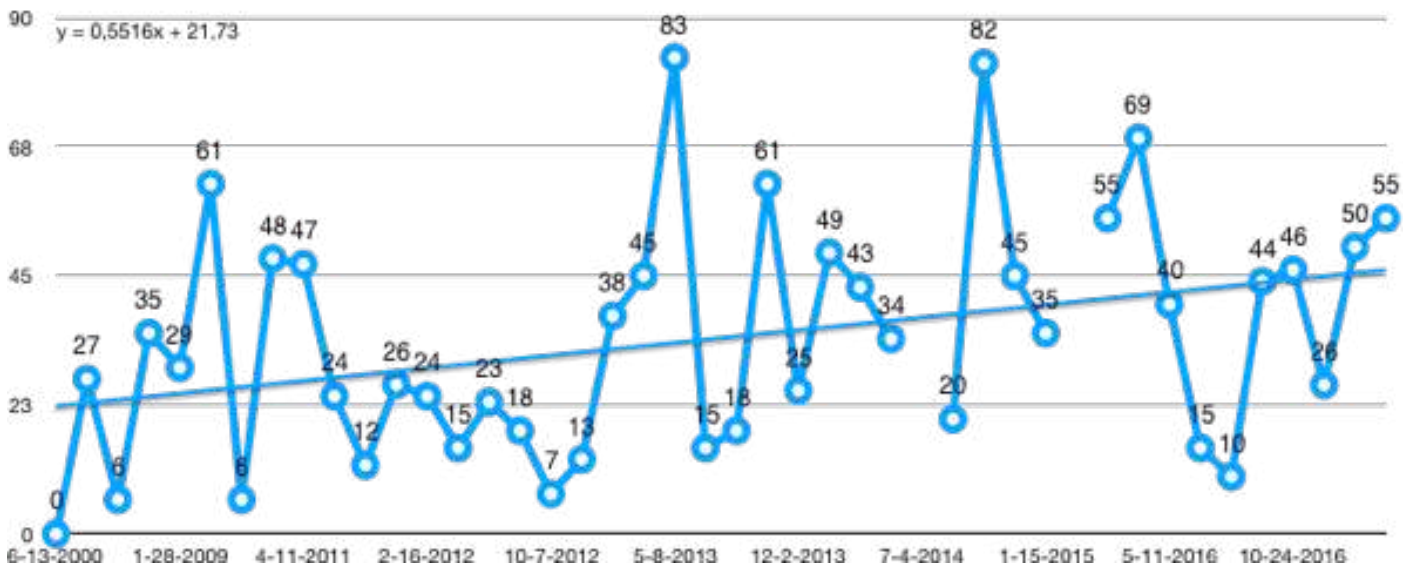
For Seungri Street, the precise geo-coordinates were from 39° 1'34.01"N 125°45'19.61"E in the north to 39° 0'36.43"N 125°45'2.16"E in the south. Between 2000 and 2018, the available data allowed 44 observations.

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Figure 13. Satellite Data Source 1 Example Image: Seungri Street in Pyongyang, 23 April 2017 [Source: Google Earth Pro]



Figure 14. Seungri Street Traffic, 2000-18



For Yanggak Bridge, the precise geo-coordinates are 38°59'16.44"N 125°45'11.52"E in the north and 39° 0'0.61"N 125°44'29.09"E in the south. Between 2000 and 2018, there were 43 observations.

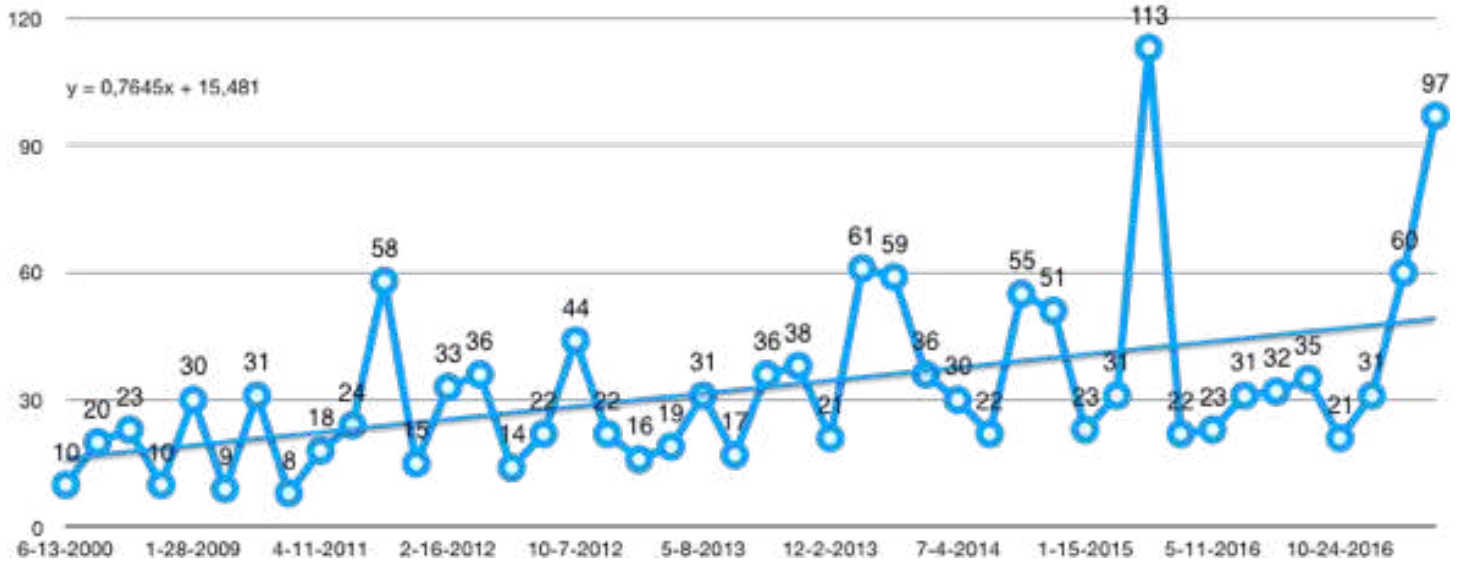


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Figure 15. Satellite Data Source 2 Example Image: Yanggak Bridge, 14 April 2014 [Source: Google Earth Pro]



Figure 16: Yanggak Bridge Traffic, 2000-18



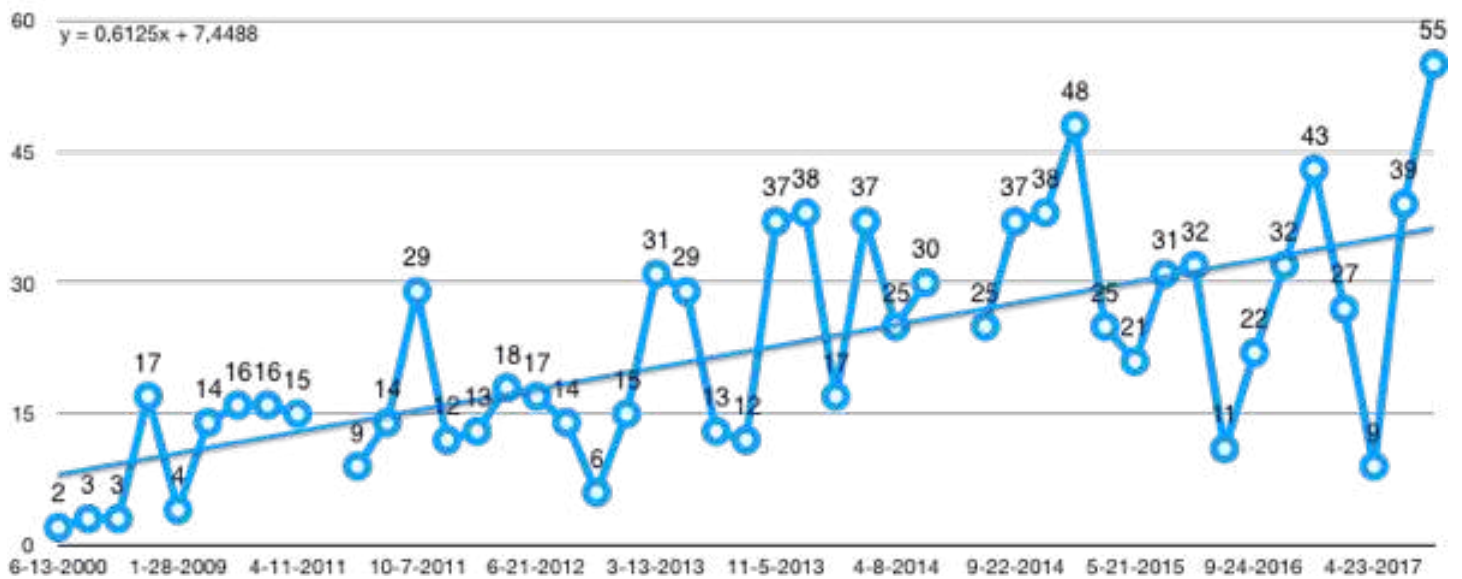
For the parking lot in front of Haebangsang Hotel, the precise geo-coordinates are 39° 0'47.01"N 125°45'1.49"E. Between 2000 and 2018, there were 46 observations.

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Figure 17: Satellite Data Source 3 Example Image: Parking Place Next to Haebang Street, 23 March 2009 [Source: Google Earth Pro]



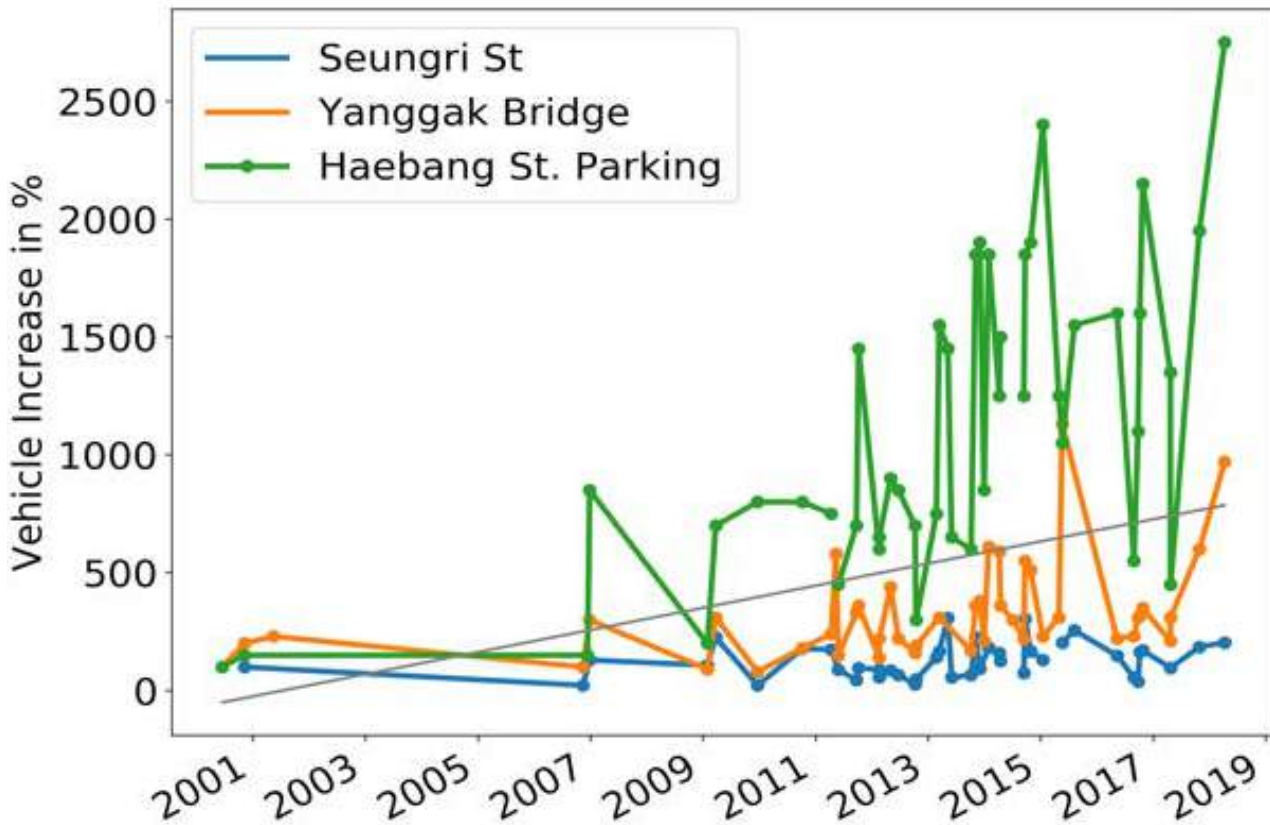
Figure 18: Haebangsan Hotel Parking Space, N Parking cars, 2000-18



## INJURIES IN THE DPRK: THE LOOMING EPIDEMIC

For all three observed areas, a clear increase in numbers of vehicles could be established, as can be seen by the trendlines. As a next step, to derive the percentage increase of all three areas, they were plotted into a single graph (Figure 19).

Figure 19: *Pyongyang Combined and Normalised Traffic Increase, in Percentage*



The percentage increase of the combined and normalized trend for all three measurements between 2000 and 2018 is 817.8%.<sup>52</sup>

It is known that in many respects, cities and rural areas outside of Pyongyang are less developed than the capital. This also affects traffic outside of Pyongyang, as private car-ownership as well as business-related traffic is highest in the capital. Therefore, traffic has been accounted for in two additional cities: Rason and Hamhung.

For Hamhung, the main road leading through the town was chosen, which is the National Route 7 from Wonsan to Rason. Route 7 also happens to be part of the Asian Highway Network from the ROK to Belarus. In the Asian Highway Network, Route 7 has the denomination Asian Highway 6. The precise geo-coordinates for the observations in Hamhung are 39°57'8.68"N 127°33'41.55"E in the north and 39°55'19.43"N 127°32'16.12"E in the south. Between 2007 and 2019 there were 17 observations. Prior to 2007, the available satellite imagery did not allow for an assessment of traffic.

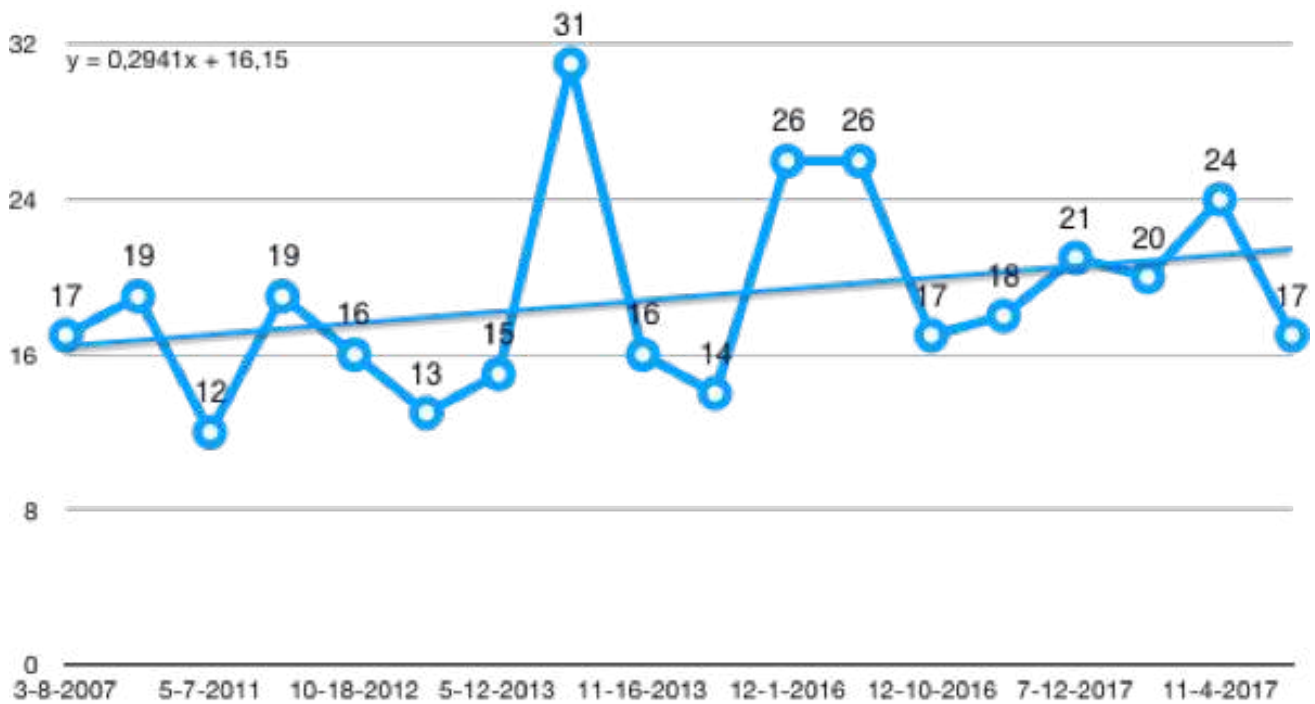


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Figure 20. Satellite Data Source 4 Example Image: Hambung Route 7, 12 February 2019 [Source: Google Earth Pro]



Figure 21: Hambung Route 7 Traffic, 2007-19





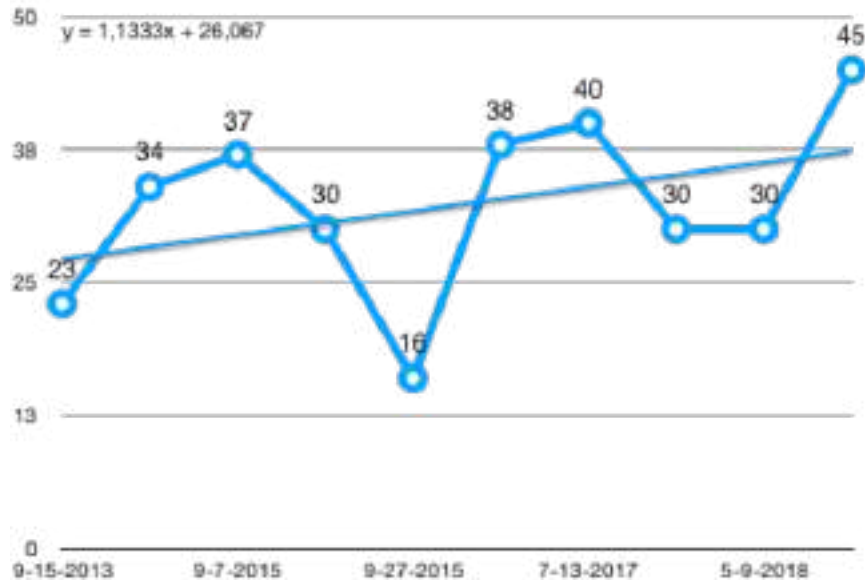
## INJURIES IN THE DPRK: THE LOOMING EPIDEMIC

For Rason, the main street through the town is also the above-mentioned Route 7. The precise geo-coordinates for the observed area are 42°15'29.79"N 130°19'0.35"E in the north to 42°14'6.86"N 130°17'5.26"E in the south. Between 2013 and 2018 there were 10 observations possible. Prior to 2013, the available imagery did not allow for an assessment of the traffic.

Figure 22. Satellite Data Source 5 Example Image: Rason Route 7, 13 July 2017 [Source: Google Earth Pro]



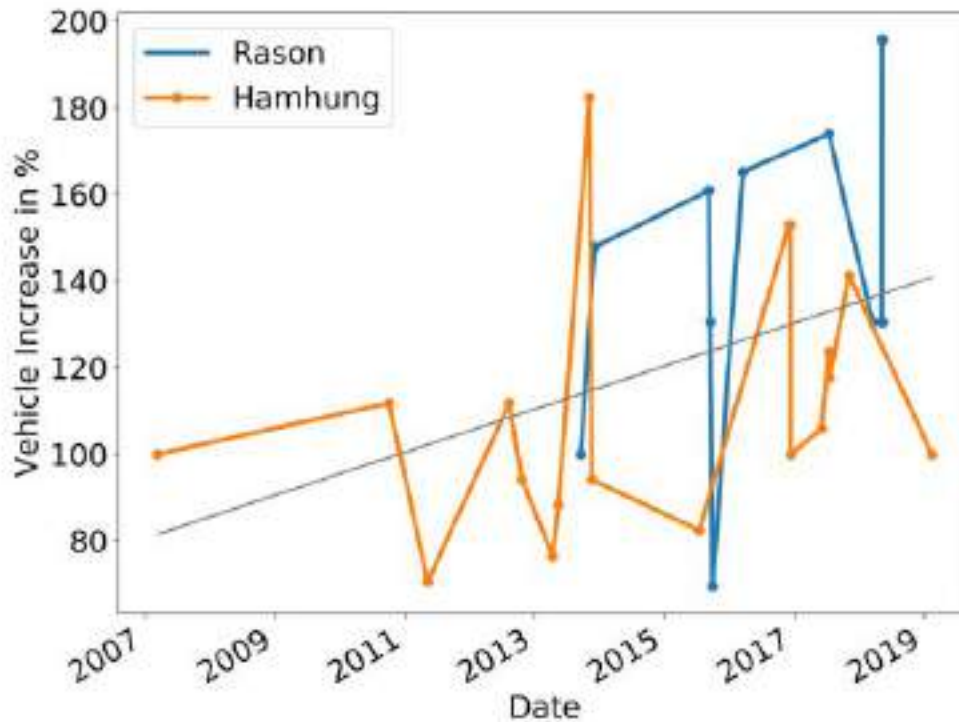
Figure 23: Rason Route 7 Traffic, 2013-18



## INJURIES IN THE DPRK: THE LOOMING EPIDEMIC

It is not surprising that the increase in traffic is smaller outside of Pyongyang. Furthermore, the baseline is rather high, as the first available satellite imagery is from more recent dates (2007 for Hamhung and 2013 for Rason), whereas the increase would likely be more evident if data from the early 2000s was available, as is the case for our measurements for Pyongyang. Again, the percentage increase of both measured areas was plotted into one graph.

Figure 24. Hamhung Plus Rason Combined and Normalized Traffic Increase, in Percentage



The percentage increase of the combined and normalized trend for both measurements between 2007 and 2019 is 59.3%.<sup>53</sup>

In summary, it can be said that traffic in the DPRK has been increasing over the past two decades. In Pyongyang, a significant increase in traffic of 818% was observable between 2000 and 2018. Outside of Pyongyang, traffic has also increased. The combined measurements of Hamhung (2007-19) and Rason (2013-18) suggest a traffic increase of 59% for the years 2007 to 2019. However, due to a lack of satellite imagery from the early 2000s for these regions, the number of observations was small and the baseline was comparatively high, so a direct comparison between Pyongyang and the two peripheral cities is not possible.

Based on these measurements and calculations, it is possible to not only see the development of road traffic in the DPRK, but also to estimate how traffic will continue to increase if the DPRK remains on the current path of limited engagement with the rest of the world and with the current sanctions regime in place or only slightly changed. In order to assess the potential increase of traffic in an opening up scenario in the near future, the following section will again use Myanmar as a model and collect data on traffic developments in the country after the opening up in 2010.

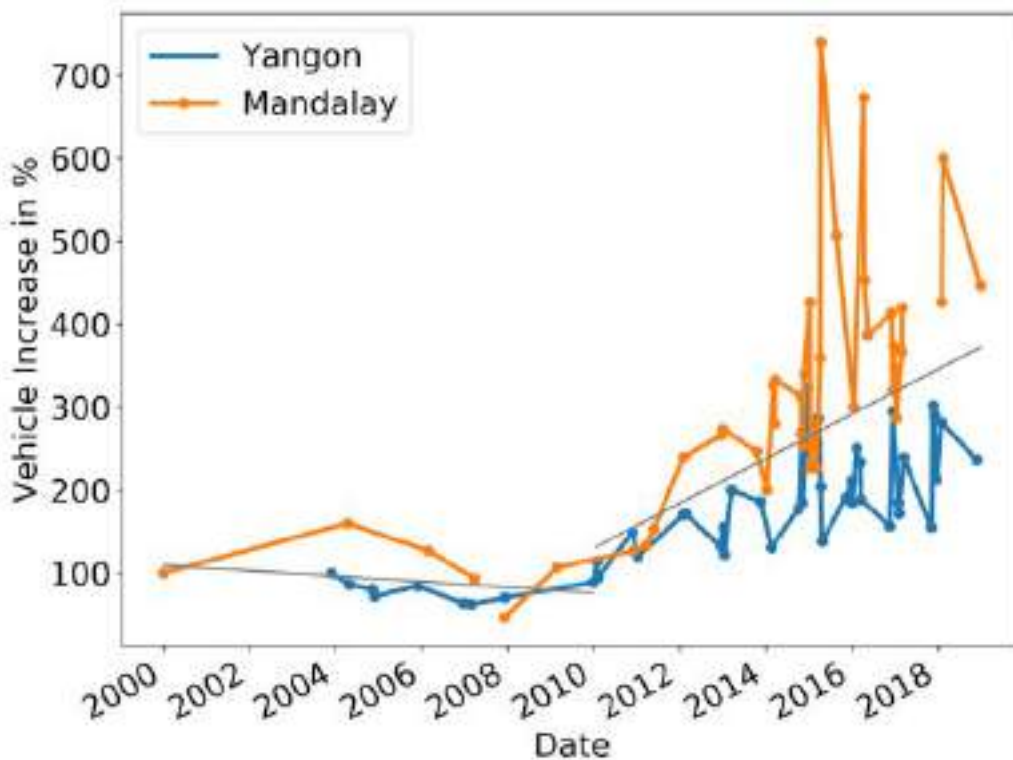
## INJURIES IN THE DPRK: THE LOOMING EPIDEMIC

### PROJECTIONS USING THE MYANMAR MODEL

This section will use two sources of data collection. To begin with, the data collection process of the above section will be replicated, i.e. remote sensing through satellite imagery will be utilised to assess traffic developments in Myanmar before and after the opening up in 2010. Furthermore, available statistics of Myanmar's traffic and traffic accidents will be used.

In Myanmar, two areas in two cities were chosen: Lower Kye Myin Daing Road in Yangon with the precise geo-coordinates of 16°47'42.60"N 96° 7'34.19"E in the north and 16°46'58.67"N 96° 8'0.07"E in the south; and the 26th (Muse Hwy) Street in Mandalay with the precise geo-coordinates of 21°58'56.86"N 96° 5'45.02"E in the west and 21°58'54.93"N 96° 6'23.94"E in the east. The available satellite imagery allowed 47 observations between 25 November 2003 and 28 November 2018 for Yangon and 43 observations between 26 December 1999 and 30 December 2018 for Mandalay. The time of all observations was 11am Myanmar time, which again allows internal consistency of the measurements

Figure 25. Yangon Plus Mandalay Combined and Normalized Traffic Increase, in Percentage

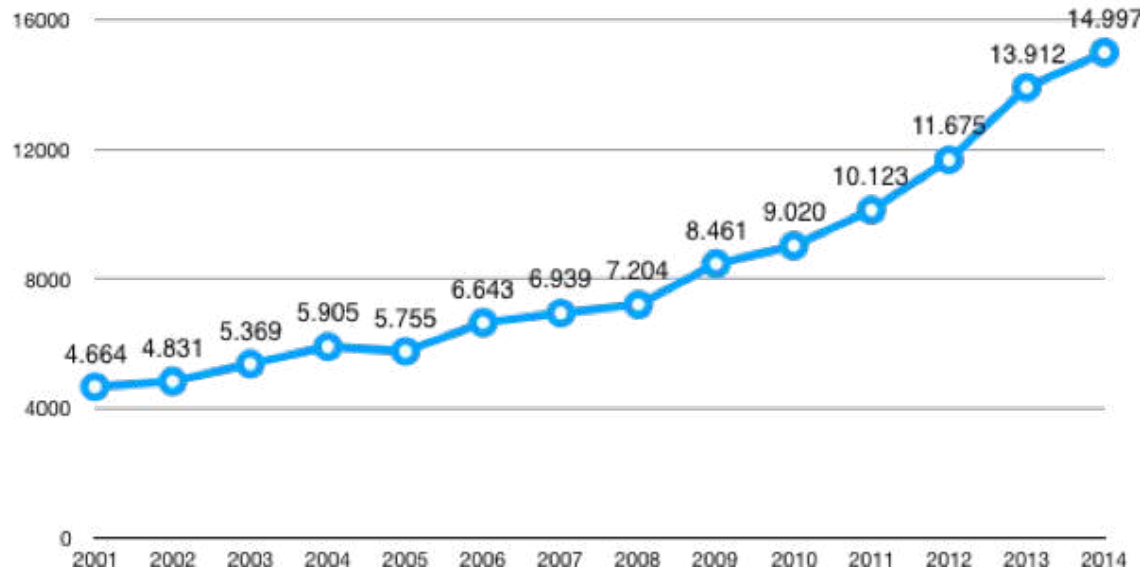


In Myanmar, the trend of traffic development between 2000 and 2009 was in fact a decrease of 17.3%. More importantly, traffic grew significantly in the years after Myanmar's opening up. In the years 2010 to 2018, the combined and normalized trend for Yangon and Mandalay increased by 240.2%.<sup>54</sup>

Furthermore, data by the Greater Mekong Subregion information portal has tracked traffic accidents in the region, including Myanmar, since 2001.<sup>55</sup> While the data on traffic accidents only goes until 2014 for Myanmar, this still allows to observe the increase in road accidents in the first five years after the country's opening up.

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Figure 26. Number of traffic accidents in Myanmar, 2001-14



Based on these numbers, we know that traffic accidents in the five years before the opening up rose from 5,755 in 2005 to 8,461 in 2009, which is an increase of 58%. In the five years since the opening up, from 2010 to 2014, the number of traffic accidents rose from 9,020 to 14,997, which is an increase of 66.2%.

The trend of increasing traffic in Myanmar is likely to continue. In an earlier section, the needs for infrastructure investment have already been discussed. Among others, it will depend on how well the public transport network of big cities is developed, and whether private households purchase private cars. Based on calculations by JICA, the percentage of private households owning cars will significantly increase in the coming years. Projections for the metropolitan area of Yangon suggest that current private car ownership is 12% and will rise to about 32% over a period of ten years.<sup>56</sup>

The above data, although limited, clearly suggests that traffic in Myanmar has been significantly increasing in the years after the opening up. In the five years after the opening up, from 2010 to 2014, traffic rose by 240%. Furthermore, the number of traffic accidents has also increased more rapidly than in the years before the opening up, even though the increase of accidents did not mirror the rapid increase of traffic. The number of traffic accidents rose by over 66% in the first five years after Myanmar's opening up. With regards to the DPRK's trauma treatment capacity needs this means that in an opening up scenario, the already high number of injuries resulting from traffic – so far 33.3% – would further increase. Based on the Myanmar data, this would mean a 10.7% year-on-year increase in traffic accidents.

## 4.4. MULTI-NATIONAL INDUSTRIAL AND INFRASTRUCTURE PROJECTS

Having established the increased injury burden that can be expected in the near future based on data from the DPRK as well as on projections from Myanmar, this section will introduce the potential contribution from multinational projects in the DPRK. Such projects are linked to significant construction activity and will also lead to increased traffic. In addition, multinational industrial and infrastructure projects will also mean an influx of foreign workers. A percentage of these will sustain



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injuries inside the DPRK, further exacerbating the already established increasing healthcare need due to construction, tourism and traffic.

Multinational industrial and infrastructure projects aiming at connecting the Korean Peninsula to the Northeast Asian mainland and the entirety of Eurasia have been seriously discussed since at least the 1990s. The Iron Silk Road from Busan to Berlin as a symbol for an end to the Korean War and peace on the Korean Peninsula is a dream for many South Koreans.<sup>57</sup> There are clear synergies between the countries involved. The South Korean and Chinese economies are highly integrated. However, trade in goods and people exchanges can only be done via the sea, but not via land routes. For the ROK, the benefits of increased connectivity in the region are high: the ROK is the 13th biggest economy in the world and a major global manufacturer.<sup>58</sup> However, the ROK has virtually no natural resources, meaning that raw materials and fossil fuel have to be shipped into the country while finished goods have to be shipped out. Trans-Korean railroads as well as oil and gas pipelines from the Asian mainland through the DPRK to the ROK are examples of potential projects.<sup>59,60</sup>

Since 2018, hopes for closer political cooperation and economic integration in Northeast Asia have increased. The summitry of 2018-19, with Kim Jong-un holding meetings with President Moon Jae-in and President Donald Trump among others, were seen as a sign of imminent changes in the Korean Peninsula. With regard to specific plans for regional development and cooperation, the Panmunjom Declaration of April 2018 represents an important milestone. The document, which resulted from the first meeting between the leaders of the two Koreas, proposed the modernization of railways and roads in the east via Wonsan as well as in the west between Seoul and Sinuiju.<sup>61</sup> In November 2018, the ROK sent a train expedition into the DPRK including engineers and planners for a fact-finding tour. They inspected 1,200 km of railways over the course of 18 days to determine the feasibility and necessary investment to facilitate trans-Korean railroads.<sup>62</sup>

Beyond infrastructure development in the border regions, North Korean Special Economic Zones (SEZs) have been the primary area of interest for multinational infrastructure and industry projects since Kim Jong-un assumed power. These SEZs are supposed to function as testing grounds for economic development and the market economy. They are also areas for trade and foreign direct investment with foreign entities, as well as for the development of tourism projects. Laws and regulations in the zones are friendly to foreign investors and differ from the rest of the country.<sup>63</sup> In 2015, the number of foreign companies invested in the SEZs was 129.<sup>64</sup> The possibility of providing electricity from China straight to the the foreign invested companies in the SEZs was planned in 2013,<sup>65</sup> but progress on this front could not be verified to this date.

The Moon Jae-in government considers the issue of cross-national cooperation in infrastructure and industry development a priority. In February 2019, the ROK government announced that as much as US\$16 bn will be spent on 225 such projects over a decade. The focus of these investments is on regional development, inter-Korean tourism and the construction of infrastructure. Infrastructure projects include a two-lane road between Yeongjong Island and Shin Island along the west coast, the modernization of railways such as the Gyeongwon Line (Seoul to Wonsan), cultural, sports and welfare centres, and petroleum and gas supply networks.<sup>66</sup>

China is the biggest driver of cross-border industrial and infrastructure projects though. Based on estimates from 2015, about 20 Chinese companies have invested in various DPRK mines, with an average of several hundreds of millions US\$ per investment.<sup>67</sup> One recent example of Chinese investment are the shipping routes between the Chinese cities of Yantai and Dalian and the North Korean port city of Nampo. Shipping operator Bohai Ferry Group plans to create commercial shipping lanes to the DPRK. Bohai Ferry Group plans to facilitate leisure travel, the transport of goods, as well as the transport of vehicles – so called ro-pax shipping.<sup>68</sup> Meanwhile, in 2018 Russian President Vladimir Putin reaffirmed his country's willingness to play a constructive role in realising the goals of the Panmunjom Declaration, as well as to cooperate on

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major multinational infrastructure and energy projects between Russia and the DPRK.<sup>69</sup> This harmonization of interests and strategies for the development of the Korean Peninsula at the highest level will strengthen both existing and planned projects and activities from Russian stakeholders. Kim Jong-un's April 2019 visit to Vladivostok following President Vladimir Putin's invitation is another indicator of Russia's plans to move forward with developing economic and industrial ties with DPRK sooner rather than later.<sup>70</sup>

In summary, all three neighbouring countries of the DPRK are pushing for closer economic cooperation and infrastructure integration in the region. Whereas China and Russia have decades-long experience of cooperation in cross-national projects along the DPRK's northern border, including through SEZs, the ROK's activities have been limited to the Kaesong Industrial Complex and isolated tourism projects in the past. Under the current government, however, a more holistic approach to the DPRK's development is possible. Based on the multinational infrastructure and industrial projects observed so far, which are clearly growing in number, we can also expect increasing trauma treatment capacity needs.

## 5. MACROECONOMICS OF INJURY CARE

### 5.1. ECONOMIC AND SOCIETAL COSTS DUE TO INJURIES IN THE DPRK

Injuries are the single largest cause of death among ages 5-29 in North Korea, as discussed in section 2. Because young people of prime working age – the drivers of the economy – are predominantly affected, injury is not merely a public health problem but has significant economic implications as well. Beyond the micro-level economic loss for the injured individuals, their families and social networks, it is likely that deaths and disabilities due to injuries create a macroeconomic ripple effect that results in the depression of GDP growth rates. A study by the World Bank found that a 10% reduction in deaths and disabilities from road traffic injuries could elevate GDP per capita by 3.6% over a 24-year period. Reducing them by half could increase GDP per capita by up to 22% in certain countries.<sup>71</sup>

Economic burden of injuries at the country level can be estimated using Disability-Adjusted Life Years (DALYs). DALYs represent years of "healthy life lost" and is calculated by the addition of years of life lost (YLL) due to premature death and years lost due to disability (YLD). In this report, we followed the methodology by Dalal et al.<sup>72</sup> and translated DALYs into GDP to estimate North Korea's economic loss due to injuries. In 2016, DALYs for injuries in North Korea was 902,700 years, as reported by the WHO.<sup>73</sup> Counting one DALY as every year an injured individual fails to productively contribute to the economy and GDP, we multiplied DALYs to GDP per capita (US\$1,700 in 2016), which yielded US\$1,534,590,000 or approximately US\$1.5 bn as the economic loss due to injuries. Putting numbers into context, this amount is nearly 110% of the total health expenditure of the DPRK (see Table 1).

Our analysis has shown that the economic burden that injuries have placed on the DPRK government exceeds the total amount that it actually spends on the health of its citizens. This makes the injury epidemic in DPRK not only a medical but also an economic priority. It is an urgent problem that needs to be addressed to improve not only the health of affected individuals but also the livelihood of the entire nation.

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*Table 1. Values Used to Calculate the Economic Burden of Disability-Adjusted Life Years (DALYs) Due to Injuries in the DPRK*

DALYs due to injuries (years)	902,700
GDP per capita (US\$)	1,700
GDP (US\$)	40,000,000,000
Economic Burden of DALYs due to injuries (US\$)	1,534,590,000
Health Expenditure (US\$)	1,400,000,000

## 5.2. ECONOMIC COST IF THE DPRK FAILS TO PREPARE IN 5 YEARS

Throughout this report, we have used Myanmar as a model to predict the future of the DPRK in the potential scenario that it opens up and undergoes reform in ways similar to how Myanmar did from 2010. We have shown in Section 4 that the volume of tourists, construction projects, and road traffic all grew dramatically in Myanmar from 2010; and that similarly, the DPRK is starting to experience a major boom in these three industries, which we predict will keep growing and put even more people at risk of serious physical injury.

As established in the previous section, the DPRK could already be under a substantial economic burden of over US\$1.5 bn from its injury epidemic. But how much more injury burden can we expect from new industrial and construction developments? If we refer to the Myanmar data in Table 2, we can see that from 2010 to 2015, or five years after Myanmar opened up, DALYs due to injuries increased by nearly 150,000 – or about 7%. Coupled with the large GDP growth that coincided with Myanmar’s economic reforms, the total economic loss due to injuries increased by 45% in the years 2011-15.

In the case of the DPRK, economic loss due to injuries has fairly stable in 2015-16 (Table 3). This is reasonable since no drastic change similar to Myanmar’s opening up and economic reforms has yet happened in the DPRK. However, in the plausible scenario that the DPRK will open up and develop at a similar rate as Myanmar did, with massive growth in tourism, construction and traffic, we can expect the economic loss due to injuries to increase at a higher rate, comparable to Myanmar’s. Using the DALY metric applied to the DPRK, we can expect the economic loss due to injuries to increase by an additional 45% from the current US\$1,534,590,000 to US\$2,225,155,500 over the course of five years. In other words, the total economic cost of the injury epidemic in the DPRK would be US\$2,225,155,500 if no measures are taken to prepare.

*Table 2. Injury DALYs in Myanmar and Their Economic Burden Over Time<sup>74</sup>*

Year	2000	2010	2015	2016
DALYS due to injuries (years)	2258,500	2,148,800	2,291,200	2,236,911
Economic loss from injuries (US\$)	\$ 436,319,615	\$ 2,122,369,760	\$ 3,075,477,760	\$ 3,149,795,094

## INJURIES IN THE DPRK: THE LOOMING EPIDEMIC

Table 3. Injury DALYs in DPRK and Their Economic Burden Over Time

Year	2000	2010	2015	2016
DALYs due to injuries (years)	907,000	953,200	913,000	902,700
Economic loss from injuries (US\$)	907,000,000	1,715,760,000	1,552,100,000	1,534,590,000

## 6. ROAD MAP FOR SCALING UP INJURY CARE CAPACITY IN THE DPRK

### 6.1. OPERATIONALIZING INJURY CARE WITHIN THE MEDIUM TERM PLAN FOR DEVELOPMENT OF THE HEALTH SECTOR IN 2016-2020

In 2015, the DPRK was a co-sponsor of the World Health Assembly resolution 68.15, calling for the “strengthening of emergency and essential surgical care and anesthesia as a component of universal health coverage”. The resolution was adopted unanimously by all the member states of the WHO. Pursuant to the mandates of the resolution, the DPRK added surgical capacity building in the provinces into its national health plan.

The DPRK announces its key priorities in the health sector utilizing a five-year strategic planning cycle. As the official health policy document, the included strategic areas become the focus of the Ministry of Public Health (MoPH) to implement. International cooperation is most productive when their programmatic areas align with the strategic plan.

In the most recent Medium Term Plan for Development of the Health Sector DPR Korea in 2016-2020,<sup>75</sup> Strategic Area #4 included the following: “introduce WHO emergency basic surgical package at the first referral level, continue upgrading of health facilities, procure the transport needed for the referral system and inter-facilities communication with priority given to remote areas, organization of the emergency health services”. In essence, the MoPH is indicating its intent to upgrade all the first referral level hospitals, more than 200, in the provinces to be able to provide timely emergency and essential surgical care. This would require renovating the building structures as needed, equip the operating rooms with oxygen, clean water, electricity, anesthesia machines, monitors, etc. Additionally, they intend to improve the prehospital and inter-hospital transportation and communication system through the addition of ambulances and expansion of the telemedicine network. Lastly, the workforce will need to be competent – i.e., trained – to perform the package of surgical procedures. To achieve its goals, a sizeable investment will be needed.

Ongoing discussions between the WHO Country Office and the MoPH indicate that the country is ready to move forward with an operational plan consisting of assessing its current infrastructural, equipment, workforce, information management, governance, and financing needs followed by a roadmap for implementation.

A rapid assessment can be performed on a small sample of county hospitals and referral facilities in all ten provinces by the WHO and/or UNICEF in collaboration with the MoPH. After setting attainable, realistic, time-bound, and measurable goals in consultation with key internal and external stakeholders, the assessment information can be used to perform a gap analysis and identification of inputs and quantities. A costing exercise will estimate a total budget from which the financing gap is identified for mobilization of external resources.



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A similar project in the DPRK by the WHO and UNICEF involving the upgrading of approximately 60 county hospitals for improving maternal and child health took place from 2005 to 2015. The cost of the project was approximately US\$60 million. In contrast, the cost of national projects to strengthen surgical care have ranged from US\$400 to US\$700 million in countries such as Zambia and Tanzania, respectively. The experience from the previous project should prove invaluable in implementing a large scale project as the one proposed especially in the monitoring and evaluation framework.

From a health system point of view, the country-wide strengthening of the emergency and essential surgical care delivery will not only enhance the timely care of the injured when surgical care is needed, but the improved facilities will also directly impact the ability to treat many other conditions beyond injury. For example, the maternal mortality rate and neonatal mortality rate would be reduced through the provision of emergency obstetrics; disabling congenital conditions such as cleft lip and palate and clubfoot could be treated locally; urgent non-traumatic surgical conditions such as appendicitis and abscesses could be treated; strokes could be better managed including with surgery when needed; and some cancer care could be dramatically improved through earlier diagnosis with surgical biopsy and resection as needed.

Just as importantly, the existing urban-rural disparities in healthcare would be mitigated since the plan would strengthen the county-level facilities and the first referral hospitals in the provinces first. This would allow for North Koreans all across the DPRK to benefit from the scaling up of injury care capacity.

Oversight and verification of improvements would be contingent on access to actual injury data. Were the DPRK to undertake a comprehensive injury reduction and treatment project, the improvements would be measurable. There is a question as to whether the data would be made available to external experts and organizations. Should the project be a cooperative undertaking involving international partners such as the WHO or UNICEF, however, the results would be shared and reportable.

A follow up report using the same methodology could also serve to conduct oversight and verification of any improvements. Above all, it would be possible to conduct a large survey of former, and perhaps current, DPRK residents and frequent visitors with experience of utilizing the injury care system. Access to good-quality commercial satellite imagery would also help with oversight and verification by allowing the production of new types of data. Most notably, monitoring traffic around healthcare facilities would allow for better understanding of system utilization.

## 6.2. FINANCING OF INJURY CARE CAPACITY SCALING UP

The DPRK lacks the resources to finance its trauma care capacity scaling up needs. The DPRK's GDP of US\$17.3 bn at the end of 2017 makes it one of the poorest countries in Asia.<sup>76</sup> DPRK is a low-income country with GDP per capita below US\$2,000 – among the lowest in the world. Furthermore, the DPRK's economy is shrinking. According to the Bank of Korea, the economy contracted by 3.5 per cent in 2017 as UN sanctions hit the country.<sup>77</sup> It is unlikely that the DPRK will achieve the growth rates needed to overcome its low-income status in the near future, considering the sanctions to which the country is subject and the need to open up and modernise its economy. Simply put, the DPRK lacks the financial resources to cover the costs of scaling up its trauma care system. Therefore, the DPRK can only realistically cover these costs through co-financing and/or external financing.

Co-financing involves the DPRK government paying a percentage of the total cost of a programme. The remaining funding is provided by international agencies, donor countries, the not-for-profit sector, the private sector or a combination of these.

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It is a model commonly used by developing countries that lack the capacity to fund their own healthcare needs in full. The share of the total cost that the country needs to cover varies depending on the partner(s). Some have clear guidelines regarding the share that the recipient country needs to pay for, while others are more flexible. In any case, the expectation is that the financing needs of the recipient country will gradually decrease and it will be able to increase its level of funding.

Two cases serve to illustrate the DPRK's use of co-financing in the healthcare sector. The first case is the DPRK's work with Gavi, a global vaccine alliance bringing together the public and private sectors to create equal access to new and underused vaccines for children living in developing countries.<sup>78</sup> Partners include the WHO, UNICEF, the World Bank and the Bill & Melinda Gates Foundation. Gavi has been assisting the DPRK in this area since 2002. Its latest assessment of its work with the DPRK – published in January 2019 – indicates that the country is expected to continue to be in the co-financing phase for at least the next five years. Between 2013 and 2016, the DPRK covered 46-48% of routine immunisation costs, with the rest paid by Gavi partners. In 2017, the DPRK covered 19% of total expenditure.<sup>79</sup>

Another case illustrating the DPRK's use of co-financing is its work with the Global Fund. This organisation raises funding from donor governments, foundations and the private sector and then partners with recipient country experts to combat AIDS, tuberculosis and malaria.<sup>80</sup> The Global Fund has a co-financing requirement which means that countries that want to access their allocated funds have to increase health spending as well as co-financing of Global Fund programmes.<sup>81</sup> The fund seems not to have had any concerns about the DPRK on this matter. The Global Fund operated in the DPRK between 2010 and 2018, with its main programme focusing on tuberculosis and a smaller one focusing on malaria. It closed its operations in the country in June 2018, even though it is committed to re-start them once “the operating environment allows the access and oversight required”.<sup>82</sup>

External financing, differently, involves a third party funding a programme implemented in the DPRK. This model is commonly used by developing countries unable to cover their healthcare costs as well. The list of funders is the same as the case of co-financing: international organisations, donor countries, not-for-profit organisations and the private sector. Funding may come in the form of a grant or a loan. Grants do not require repayment from the recipient country, whereas loans do – sometimes, including payment of an interest. The expectation is that recipient countries will eventually be able to graduate and will not need to receive external funding anymore. The ROK, for example, received external financing for decades, eventually graduated, and is now a donor country.

There are several cases of external financing of DPRK's healthcare needs. UNICEF is an example of an international organisation working to support the healthcare needs of the North Korean population. It first started operating in the country in 1985, opening its permanent office in 1996. Its work in the country includes the provision of medical equipment and training to North Korean health professionals to support the needs of children, the immunisation of children and pregnant women and other programmes to prevent diseases.<sup>83</sup> Its current country programme, scheduled to run until 2021, takes a holistic approach to the healthcare needs of children including food security and social wellbeing.<sup>84</sup>

The Eugene Bell Foundation is an example of a not-for-profit organisation working in the healthcare sector in the DPRK. The foundation has been providing food aid to the DPRK since 1996, supporting the country's fight against tuberculosis since 1997, and has also provided training opportunities to North Korean doctors.<sup>85</sup> Its work includes supporting 12 medical facilities to treat tuberculosis spread throughout the country.<sup>86</sup> The activities of the Eugene Bell Foundation include the purchase and shipment of medicine and related equipment to treat tuberculosis, for which it received an exemption to the current sanctions regime on the DPRK in January 2019.<sup>87</sup>

### 6.3. SCALING UP OF INJURY CARE CAPACITY UNDER THE CURRENT POLITICAL CONTEXT

Why is there an urgent need to strengthen the injury care system in DPRK? In short, the country needs to build its health-care system, and the trauma care system needs to be strengthened before it opens up. The UN estimates that nine million ordinary North Koreans lack sufficient access to health services.<sup>88</sup> Vulnerable groups such as children, pregnant women and the disabled are most affected by deficiencies in the DPRK healthcare sector. Simply put, the government needs to improve its healthcare in terms of access to essential medical equipment and medicines as well as the development of healthcare providers' professional competencies.<sup>89</sup> The DPRK needs external financing and training to overcome the shortcomings of its healthcare sector.

This applies to the trauma care system. As shown earlier in the report, the DPRK has an inadequate trauma care system. Injuries are the fourth leading cause of death in the DPRK, and the biggest killer among the youth and working age. Youth mortality caused by injuries has steadily been growing over the past two decades. Put another way, the country's human capital is most affected by its inadequate trauma care system. The working age population that should be driving economic growth is being depleted by injuries. If and when the DPRK is able to open up its economy, the situation is most likely to get worse unless the trauma care system is improved.

Furthermore, if realized, the opening up of the DPRK is bound to attract more foreign tourists and labour. With regards to foreign tourists, existing data on tourist numbers, anecdotal evidence in the form of reported accidents, and the experience of Myanmar's opening up suggests that tourist numbers are already increasing. This is a source of revenue and employment for the country, including ordinary North Koreans. Were the DPRK to gain a reputation as an unsafe country for tourists who suffer an accident, tourist numbers would be likely to slow down.

Regarding foreign labour, the opening up of the DPRK would no doubt attract expatriate workers and migrant labour as has been the case elsewhere in East Asia for decades. Foreign firms investing in the DPRK are very likely to send expatriate workers to work alongside local employees. Migrant labour will move to the country or in and out of it in search for business opportunities. Foreign labour brings management and technical skills, business expertise, networks and, in some cases, investment from which the DPRK economy would benefit. However, foreign labour would gradually become reluctant to relocate if the DPRK gains a reputation as a country where a road accident or work accident results in a serious injury or even death.

There is a question as to whether the DPRK can build its trauma care system before it opens up due to the current sanctions regime in place. The answer is yes. The DPRK is subject to comprehensive UN and bilateral sanctions by several countries, including the US and the ROK. In the case of the UN and the US, sanctions were significantly tightened in 2016-17. This new round of sanctions went beyond targeting the government's nuclear and weapons of mass destruction programmes and aimed at affecting the country's economy.<sup>90</sup> It can be said that the existing sanctions regime seeks to change the behaviour of the DPRK by targeting not only its leaders, but also ordinary people. Indeed, recent reports suggest that sanctions are affecting both state-run entities and the private sector.<sup>91</sup>

The current sanctions regime, however, explicitly excludes humanitarian assistance from its targets. This includes the healthcare sector.<sup>92</sup> Indeed, recent and ongoing exemptions to the sanctions regime granted by the Security Council Committee established pursuant to resolution 1718 (2006) have focused on humanitarian assistance including medical equipment.<sup>93</sup> In 2018, the UN Security Council was warned that its stringent interpretation of the sanctions regime was preventing the delivery of humanitarian assistance.<sup>94</sup> The Office of the UN Resident Coordinator in the DPRK has also warned

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that the delivery of aid to the DPRK has been negatively affected by the sanctions regime, even though humanitarian aid is excluded from it.<sup>95</sup> Indeed, only 24% of UN humanitarian support programme's funding needs in the DPRK for 2018 have been met due to concerns by donors regarding falling foul of the sanctions regime and diplomatic pressure.<sup>96</sup> The legal framework set up by the UN sanctions regime and the recent, less stringent approach by the UN Security Council towards exemptions on the grounds of humanitarian needs shows that trauma care system needs can be met without the rollback of sanctions.

The US bilateral sanctions regime is very comprehensive and supplements the UN's regime.<sup>97</sup> But similarly to the UN regime, it also explicitly exempts humanitarian assistance. This includes health-related initiatives.<sup>98</sup> Throughout 2018, stringent application of sanctions even prevented US nationals seeking to provide humanitarian assistance from travelling to DPRK. This strict understanding of the sanctions regime was reviewed from December 2018.<sup>99</sup> In recent months, US citizens have received exemptions from the US government to travel to the DPRK for humanitarian purposes. This further reinforces the point that the provision of equipment and training for the DPRK to build its trauma care system can proceed even without rolling back existing US bilateral sanctions.

The ROK, which also has its own bilateral sanctions on the DPRK, believes that sanctions should start to be removed to encourage the DPRK's denuclearization. The ROK government has also earmarked KRW1.1 trn (US\$890 million) for inter-Korean projects in 2019.<sup>100</sup> However, the ROK has not provided humanitarian assistance to the DPRK at the governmental level since 2017. According to the Ministry of Unification, there are no plans to change this stance in the near future.<sup>101</sup> This suggests that the South Korean government is wary of being out of step with the US on DPRK policy. Yet, the healthcare sector is excluded from both sets of sanctions as just explained. This means that building the North Korean trauma care system is also excluded.

The key point is that humanitarian aid should not be politicized. This includes trauma care. Existing sanctions already affect the most vulnerable North Koreans above all.<sup>102</sup> The healthcare needs of ordinary citizens are going unmet. Even the potential concern that providing aid to the DPRK benefits its military and therefore building its trauma care system will also prop up the military should not stop the latter. This concern should not exceed the need of helping civilians, including the children and young people who most suffer from DPRK's inadequate trauma care system. As the Office of the UN Resident Coordinator in the DPRK makes clear, there are robust implementation, coordination and monitoring mechanisms in place. Furthermore programme implementers have access to aid recipients across all provinces in the country.<sup>103</sup> There is no reason to believe that this would not be the case in the case of a programme to build the DPRK's trauma care system.



### 7. CONCLUSION

There is a clear and urgent need to strengthen the injury care system in the DPRK. Injuries are the fourth leading cause of death in the country – and the biggest killer among the youth and working age. Indeed, youth mortality rates from injuries have been increasing among the youth over the past two decades. Road traffic and occupational accidents related to falls and mechanical force are the greatest source of disability and death among the working age. Without a proper injury care system, the situation will only get worse.

The current injury care capacity in the DPRK is inadequate. Access to hospital care for injury patients is difficult. Most notably, there is a shortage of ambulances and fuel to power them, which means that injured patients cannot always be transported to hospitals. This is especially the case outside of Pyongyang. Hospitals, meanwhile, often lack appropriate equipment to treat injuries. Sometimes even the supply of electricity is deficient. Again, conditions are worse outside of Pyongyang.

The situation is likely to get worse. There is a construction boom in Pyongyang and other parts of the DPRK. Infrastructure, residential and leisure projects are popping up across the country. Tourist numbers are growing, especially from China. Road traffic has been increasing in recent years and there is no reason to believe that this trend will not continue. Were the DPRK to open up, the recent experience of Myanmar suggests that construction, tourism and traffic will boom. The country's trauma care system is already unable to cope with the current injury burden; the situation would only get worse were an opening up process to take hold, raising deaths from injuries and slowing economic growth.

The DPRK has prioritized injury care as part of its Medium Term Strategic Plan for the Development of the Health Sector for 2016-2020. The government is committed to “introduce WHO emergency basic surgical package at the first referral level, continue upgrading of health facilities, procure the transport needed for the referral system and inter-facilities communication with priority given to remote areas, organization of the emergency health services”. This suggests that the DPRK understands the need to improve its injury care system.

This is thus an opportunity for the international community to cooperate with the DPRK, even under the current sanctions regime. Simply put, the DPRK cannot finance its trauma care system scaling up needs. A co-financing model is necessary. This is not a new model, since the WHO, UNICEF and other organizations already use it in other areas of the healthcare sector. Meanwhile, the existing sanctions regime clearly excludes humanitarian assistance from its targets. This applies to both UN and US sanctions. Therefore, there is no need to roll back sanctions to cooperate with the DPRK to strengthen its trauma care system.

Ultimately, humanitarian aid including in the area of trauma care should not be politicized. Ordinary North Koreans are already being affected by shortcomings in the DPRK's trauma care system, with the youth suffering disproportionately. The government seems to be aware, since it is prioritizing strengthening this area of the healthcare sector. Cooperation with the international community in this area can only bring benefits for ordinary North Koreans who are not active participants in geopolitical developments in the Korean Peninsula.

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