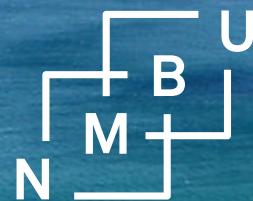




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Editor's Note

NMBU's Student Journal of Life Sciences showcases stimulating topics from our diverse university. In this volume we have articles from: Agronomy, Biology, Ecology, International Development, International Relations, and Landscape Architecture. Every volume of the *Student Journal* reflects the signature of a new Editorial Board, and this year is no different. The layout of Volume 6 has a modern design that mirrors contemporary concerns for the general public as well as specialised scholars.

Although the layout and content are unique, the process and procedure for creating it remain the same. All submitted papers are peer reviewed through rigid protocol. This exposes students to the demands of professional scholarship and international standards of academic writing. Our Review Board provides comprehensive feedback to submitted papers. Papers are selected based on this feedback and the authors work with a member of the Editorial Board to create the final versions of their papers. Consequently, the papers in this volume have been evaluated several times to ensure quality and credibility.

On that note, I wish to thank the Editorial Board for their professionalism and dedication. I also wish to thank the Review Board for their recommendations, which led us to the final papers in Volume 6. However, this effort would not be possible without our contributing authors and photographers: Thank you for your papers and photographs. We received nearly 50 papers and 90 photographs, and I wish we could have published everything. But even with high-quality team members and submissions, a student journal needs support.

Thank you, Academic Advisor Professor William S. Warner for your unwavering trust—it means more than you may realise. Additionally, the confidence of Rektor Mari Sundli Tveit and the Learning Centre made it easy to promote the *Journal*. Thank you, Professors, for encouraging your students to pursue critical analysis to advance NMBU scholarship.

Enjoy.

Editor-In-Chief
Peder Aarseth Krøgenes



Photo: Mariann Midbøe

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Bread, Life, and the Arab Spring: The Impact of Food Insecurity on Egypt's Popular Unrest of 2011

Torunn Brånn

MSc Candidate in International Environmental Studies

"Let Them Eat Baklava," the title of an article on the Arab Spring featured in *The Economist* in 2012, refers to the infamous phrase "Let them eat cake," commonly attributed to Queen Marie Antoinette of pre-revolutionary France. While Marie Antoinette might not actually have said these very words, the situation they hint at—the ruling elite failing to address a lack of food among the working class—would eventually determine her fate. Hungry, marginalised masses have changed the course of history more than once, and as the aforementioned article points out, food insecurity also contributed to setting the stage for the popular unrest in the Middle East and North Africa at the beginning of this decade. The Arab Spring was undoubtedly a product of multiple layers of discontent. Lack of democracy was a significant and visible one, and this aspect of the conflict received wide coverage in Western media. Just as important, perhaps, were the food prices that had recently sky-rocketed, leaving large numbers of already hungry people breadless and frustrated.

This essay investigates possible links between food insecurity and socio-political unrest in Egypt in 2011. In the beginning of that year, wheat prices in Egypt had increased by up

to 300 per cent (Sternberg, 2012). The consequences this a price spike were grave for a people that count on wheat-based bread for a third of their average daily calorie and protein intake (Croppenstedt, Saade, & Siam, 2006). Because of wheat's importance as a staple food, the emphasis of this analysis is how access to wheat may have played a role in Egypt's socio-political unrest of 2011, an aspect of the Arab Spring events that has not received proportionate attention in Western media and academia. Perhaps we were so thrilled by the idea that the Arabs finally wanted to replace their authoritarian governments with Western-style liberal democracies that we forgot to ask whether or not the protesters had eaten breakfast.

Underpinning the Case

Three core aspects of the Egypt case are instrumental to the context of this analysis: (a) Egypt relies heavily on wheat, of which almost half is imported, to feed her population; (b) a large number of Egyptian people are food insecure despite a great deal of state subsidies; and (c) extreme weather events affect global wheat prices, a conjunction that caused a significant spike in world market wheat prices in 2010 and 2011.

Wheat Dependency and “Bread Democracy”

It is said that yeasted bread was invented in ancient Egypt (Lohman, 2012). Regardless of its origin, bread is the most important food staple in present day Egypt; in Egyptian Arabic, “bread” and “life” share the same word, *aish* (Black, 2008). Wheat-based bread covers one third of the daily calorie and protein intake of the average Egyptian, and makes up most of the diet for the country’s numerous poor (Croppenstedt et al., 2006). However, Egypt has a scarcity of fresh water and arable land, factors that limit the country’s domestic wheat production. National self-sufficiency in wheat is on average 55 percent; the remaining 45 percent of consumption makes Egypt the largest wheat importer in the world (Croppenstedt et al., 2006; Sternberg, 2012). With such a considerable gap between domestic production and consumption, Egypt is vulnerable even to minor price hikes in the global wheat market.

To shelter the population from price fluxes, the Egyptian state has long-standing traditions of subsidising bread and other important commodities. About half of the wheat consumed in Egypt is subsidised (Croppenstedt et al., 2006). This is a costly exercise: The Food and Agriculture Organization of the United Nations (FAO) calculated the state’s wheat bill as claiming more than five per cent of total government expenditure in 2004/2005, years when the world market wheat price was relatively low (Croppenstedt et al., 2006). In 2008, when bread riots broke out due to the then-record wheat prices, the Mubarak regime’s response was to increase subsidies accordingly, making it to the gloomy milestone of 10 percent of the gross domestic product (Lybbert & Morgan, 2013). However, paying the bill for stable food prices has proved a convenient way to obtain social stability in Egypt and other Arab countries. Affordable bread is part of a “broader social contract between the Egyptian government and the population” (Croppenstedt et al., 2006, p. 5). Young Egyptians mockingly call this practice “bread democracy”: as long as you shut up, the government will feed you. If it fails to do so, the people will stand up. This is exemplified by the so-called bread intifada following the Sadat regime’s attempt to withdraw wheat subsidies in 1977 (Sternberg, 2012).

Food Security in Egypt

Thanks largely to the state’s staple subsidies, Egypt’s 84 million citizens have access to certain amounts of affordable food. Still, food is relatively expensive: An average Egyptian spends 38 percent of their income on food (Sternberg, 2012). There are also problems related to the distribution of benefits, as is often the case with blanket subsidies. Egypt has a large rural population (about 58 percent) and access to government-run bakeries in rural areas is limited by communication and transportation means. In 1996/1997, this problem led to only 30 percent of subsidies reaching the rural population (Croppenstedt et al., 2006). Overall, 66 percent of the poor and 75 percent of the non-poor receive subsidised bread, leaving a third of the poor population without access to affordable bread (Croppenstedt et al., 2006). Food security, as defined by the FAO, is “a complex condition” that encompasses multiple dimensions such as availability, access, utilisation and stability of food supplies (FAO, 2013). As Egyptians on average get one-third of their daily carbohydrate and protein intake from bread, the lack of bread severely affects food security.

Another challenge to food security in Egypt is the lack of diversity in diets, especially among the poorer parts of the population who mainly consume wheat-, corn-, and rice-based products. High carbohydrate intake, combined with a low level of important nutrients, produces a range of diet-related health concerns. Three out of ten children under five are stunted (meaning they are considered too short for their age), and more than one out of five are severely stunted (UNICEF Egypt, 2010). At the same time, obesity is a fast-growing concern. According to UNICEF (2010), 19 percent of boys and 25 percent of girls aged 11-19 are overweight. For adult women, the number is even higher at 40 percent. Food supply and child under-nutrition are two factors that the International Food Policy Research Institute (IFPRI) takes into consideration when calculating a country’s annual score in the Global Hunger Index. In the 2010 Index, Egypt received an overall score of 7.9 and the food insecurity status of “serious” (Lybbert & Morgan, 2013). This is slightly lower (better) than the average for the Middle East and North Africa region at 8.4, but significantly high-

er than neighbouring countries such as Jordan, Saudi-Arabia, Lebanon, and Libya, who all received the score 4 (Lybbert & Morgan, 2013).

Global Wheat Trade and Extreme Weather Events

Relying heavily on imported grains to feed her population, Egypt finds herself at the mercy of global wheat prices. That is not a pleasant position to be in: Only 18 percent of global wheat production crosses borders, which makes the pool of wheat available in the world market relatively small (Sternberg, 2012). The price curve of this pool fluctuates with the production levels of the major grain producing countries, which are usually large grain consumers themselves (Sternberg, 2012). This phenomenon became evident in 2010 and 2011, when world wheat production failed to meet demand. During these two years, a series of extreme heat and drought events across Eurasia caused a severe drop in wheat yields. In Russia, production fell by almost a third in 2010, prompting the world's largest wheat exporter to ban all exports. In neighbouring Ukraine, another important grain producer, production decreased by 19.3 per cent (Sternberg, 2012). The supply side of the world wheat market was reduced considerably, and the demand side added to the chaos. When China's weather monitoring systems predicted extremely difficult weather conditions for the winter season of 2011, Beijing ordered massive purchase of grains to ensure domestic food security and social stability (Sternberg, 2012). Responding to these major shifts in both the supply and demand sides of the world market, wheat prices swelled rapidly. In February 2011, when the uprising in Cairo started, prices had more than doubled from the already high level of June 2010 (Sternberg, 2012).

Feeding the Turmoil: Food Insecurity in the Unrest

A picture of pre-uprising Egypt has been drawn. A nation highly dependent on wheat, of which about 45 percent is imported, was struggling to feed its largely poor population. In 2010 and 2011, world market prices for wheat rose dramatically due to a string of extreme weather conditions that hit important wheat-growing regions. Despite a large part of the Egyptian population receiving state-subsidised bread, half of

the wheat consumed was bought at market price, which fluctuated according to world market prices. Thus, Egyptian consumers were facing a sharp decline in purchasing power in 2010 and 2011. To what degree do these factors correlate with the uprisings that followed? This question will be addressed by exploring possible linkages between food insecurity, high wheat prices, and socio-political unrest.

A Wider Concept of Food Insecurity

The wave of events that was soon dubbed 'The Arab Spring' swept across several Arab and neighbouring countries in the winter of 2010 and spring of 2011. Demonstrations were characterised by young, often educated protestors rising up against authoritarian regimes (Lesch, 2011). It may seem that this picture of an uprising carried out by middle-class kids armed with smartphones and hash-tags conflicts with the idea that food security was an important ingredient in the unrest. "To say that food is pushing them onto the streets is overstating the case," claimed senior FAO economist Abdolreza Abbasian (as cited in Lybbert & Morgan, 2013, p. 369). Lybbert and Morgan (2013) elaborate on this view: "Those who took to the streets and continued marching when even their lives were in danger were certainly not vulnerable and food insecure by standard measures of vulnerability, hunger, and under-nutrition" (p. 366).

While it is not unlikely that some of the protestors were motivated by solidarity with their more marginalised compatriots, Lybbert and Morgan (2013) suggest widening the concept of food insecurity when analysing the case of Egypt. These authors' broader understanding of food insecurity encompasses a general threat to the preferred lifestyle of the protestors as well as an outlook towards future well-being, or the lack thereof: "The threat of food insecurity may be just as potent a trigger for desperate acts as food insecurity in itself" (Lybbert & Morgan, 2013, p. 367). When an insecurity threat is perceived to be caused by a state of injustice where the government or the ruling elite deprives people of privileges, rights or goods for their own benefit, it can cause moral fury and ultimately spark violent action, as in the case of the Arab Spring (Lybbert & Morgan, 2013).



Underestimating the Impact of Food Prices

While the majority of the protesting crowd in Tahrir Square and other locations around Egypt may indeed have been relatively educated and privileged, critics point out that the crowd was not as homogeneous as many media reports portrayed it to be. The urban, poor and working class constituted a substantial portion of the demonstrating masses. Beinín (2012) argues that workers mobilised at an early stage of the demonstrations and “deserve more credit for [Mubarak’s] ouster than they are typically given” (p. 7). The first new institution to rise from the ashes of the revolution was in fact the Egyptian Federation of Independent Trade Unions (EFITU), which challenged the lawful monopoly of the state-controlled trade union (Beinín, 2012). One of the main concerns of the new union was to increase minimum wages and thus strengthen the purchasing power of the working class. In February 2011, the EFITU adopted a proclamation, “Demands of the Workers in the Revolution,” which established access to food as a crucial part of the post-revolutionary agenda:

If this revolution does not lead to the fair distribution of wealth it is not worth anything. Freedoms are not complete without social freedoms. The right to vote is naturally dependent on the right to a loaf of bread. (as cited in Beinín, 2012, p. 8)

Evidently, the lack of food security was an important ingredient in the discontent of the working class and urban poor that eventually contributed to overthrowing the government. This link resurfaced when Egyptians turned to the ballot boxes in June 2012 in their first free presidential election and voted for the Muslim Brotherhood’s candidate Mohammed Morsi. Morsi’s Islamist ideology differed significantly from that of the secular, educated youth who are commonly labelled the architects of the revolution. However, his promises to help the poor, which included ensuring higher quality of and better access to subsidised bread, imply that food security was a notable concern for the broader Egyptian electorate (Lybbert & Morgan, 2013).



Food access is hard politics in Egypt. Hence, it could be argued that greater emphasis should be placed on the impact of food price development when analysing the Arab Spring in Egypt. Weinberg and Bakker (2015) have investigated the general connection between food prices, social policy, and conflict. They base their analysis on the political-economic idea that citizens will react to economic grievance by punishing the government, either through the ballot or, in more extreme cases, through acts of revolt and unrest. This requires citizens to hold certain knowledge of the economic situation of their country. Food prices, according to Weinberg and Bakker (2015), “are remarkably ‘user-friendly’ economic indicators—particularly when they change abruptly or dramatically” (p. 312). As access to food is vital to human well-being and, ultimately, to our survival, increasing food prices carry high potential for sparking action (Weinberg & Bakker, 2015). This is especially valid in countries such as Egypt, where the average household finds itself beneath, or just above, the poverty line.

Outlooks to Improving Food Security

As previously noted, Egypt’s recent history includes several examples of social unrest caused or fuelled by food insecurity. With a growing population and a global market trend of rising food prices, Egypt’s tradition of mitigating such unrest by increasing subsidies has caused her to paint herself into a corner. As Lybbert and Morgan (2013) note, the government “will no longer be able to rely on subsidy-based solutions to price spikes: generous subsidies may simply be financially infeasible” (p. 367). It is therefore necessary to investigate alternatives for improving food security in Egypt.

Breisinger, Ecker, and Tan (2015) assess measures that governments in conflict-prone states may take in response to food price shocks. They suggest, “In the short run, public reserves and diversified sources of food can help safeguard against global food price volatility, especially for countries that are heavily dependent on food imports” (Breisinger et al., 2015, p. 58). Breisinger et al. (2015) also emphasise the importance of smallholder farmers in agricultural growth, and propose measures such as “facili-

tating their access to inputs such as seeds and fertilisers, extension services, and weather-based crop insurance” (p. 58). These measures support domestic production rather than seeking to solve problems with the consumption side of the market.

Increasing Egypt’s domestic wheat production would have several positive effects besides alleviating the unpredictability of global prices. However, there are serious challenges to increasing domestic production. Because Egypt has limited arable land and water, an increase in wheat area would mean a reduction in the area used for clover production. Clover is an important fodder input in livestock production, and increased prices would reduce the nation’s livestock production capability. According to the FAO, this could have far-ranging negative social impacts, as livestock production makes up 30 percent of value added in Egyptian agriculture (as cited in Croppenstedt et al., 2006). Furthermore, livestock is usually the most important income source for farm households and is therefore important for keeping up rural employment (Croppenstedt et al., 2006).

An alternative to increased domestic wheat production could be innovative agriculture systems utilising land resources that are otherwise unexploited. While Egypt lacks arable land in the traditional sense, she certainly has no lack of land altogether. An exciting prospect could be to explore the possibility of desert farming. Pilot projects for food production in desert environments, such as the Sahara Forest Project in Qatar and Jordan, have already been established in several neighbouring countries. With only sunlight and seawater (and substantial capital) these production units output up to 75 kilograms of vegetables such as tomatoes, peppers, and eggplants per square meter of land (Clery, 2013). This idea complies with the advice of Breisinger et al. (2015) to diversify food production, as well as ensure some diversity in the diet of consumers by increasing the availability of vegetables. A major obstacle to the deployment of such projects in Egypt, however, is unfavourable conditions for private investments. Corruption and crony capitalism hamper innovation and development in the private sector (Lybbert & Morgan, 2013). Unless the state

itself or the associated elite decides to invest in such programs, it seems unlikely that they would succeed in Egypt's political climate today.

Conclusion

In terms of food, Egypt finds herself in the most import-reliant region of the world (Lybbert & Morgan, 2013). Heavily dependent on wheat imports, Egypt's economy is closely tied to international wheat prices on both state and household levels. As the purchasing power of most households is already relatively low, spikes in wheat prices have helped fuel social turbulence on several occasions. This was the case in the 2011 unrest. There are, however, differing views on whether food insecurity was merely one in many factors setting the stage for the recent revolution, or if it was in fact "the smoking gun" (Lybbert & Morgan, 2013, p. 366). This essay provides support for the latter, as it highlights the contribution of sharply rising wheat prices to the turmoil. Expensive wheat directly threatened the poorer population's ability to feed themselves, and rattled the social contract mockingly described as "bread democracy." The correlation between high wheat prices and social unrest can be further illuminated by adopting Lybbert and Morgan's (2013) wider interpreta-

tion of food insecurity. These authors include a dimension that takes into account the threat of future insecurity and a general reduction in standards of living, and point at how this can in fact be as effective a motivator for revolt as actual hunger (Lybbert & Morgan, 2013).

In a case of food business as usual, Egypt's politicians should brace themselves for more turbulence. Wheat prices are likely to keep rising both domestically and globally, thanks to the combination of a steadily growing population and increasingly difficult climate conditions. Mitigating price increases with subsidies is no longer a viable option, as Egypt's finances are already under heavy pressure. While there is the possibility of diversifying domestic food production by introducing desert farming projects, it must be acknowledged that Egypt's current political climate poses challenges for these large, risky private investments. Whether or not they manifest as a desert bloom, measures to secure access to affordable food for the public will be key to political stability in Egypt in the future. This acknowledgement should imprint policy making in Egypt, and also Western media and academia's analysis of the political situation in the region. After all, one cannot eat democracy.

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Letter

Regional Specialisation Policies in Norwegian Agriculture Should be Revised

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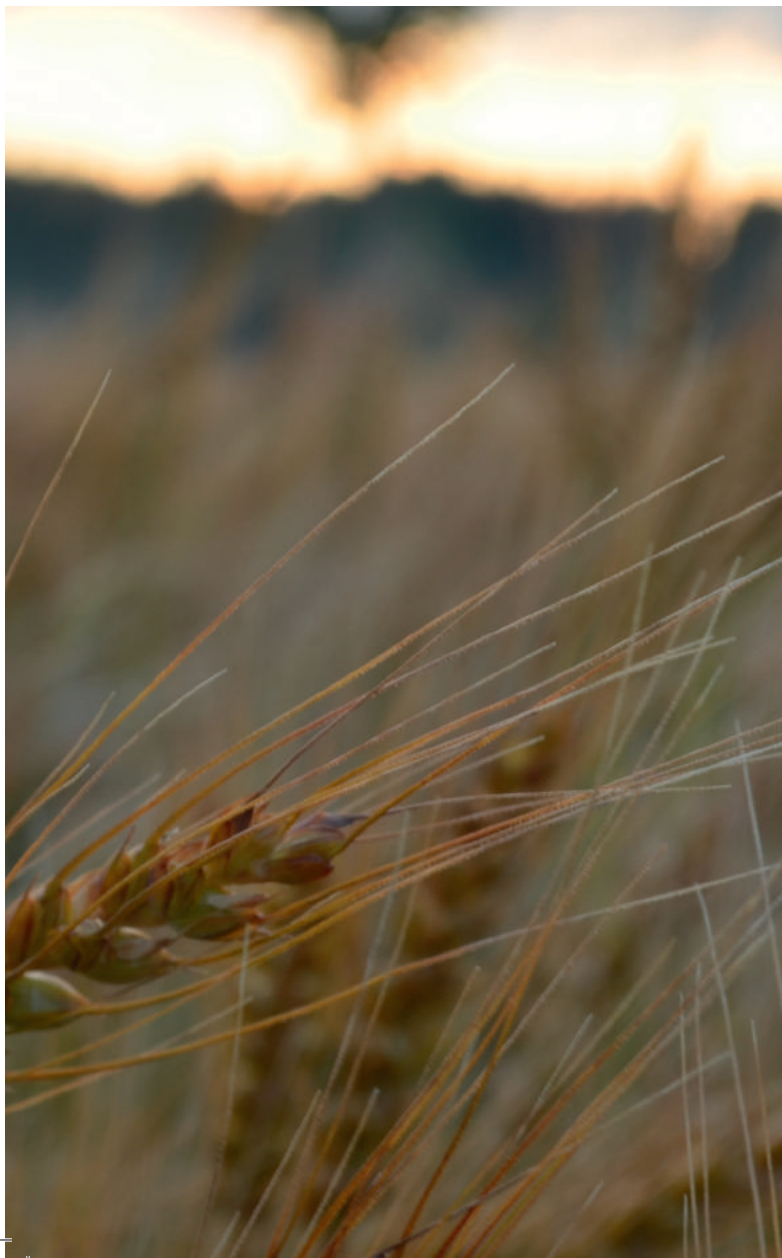


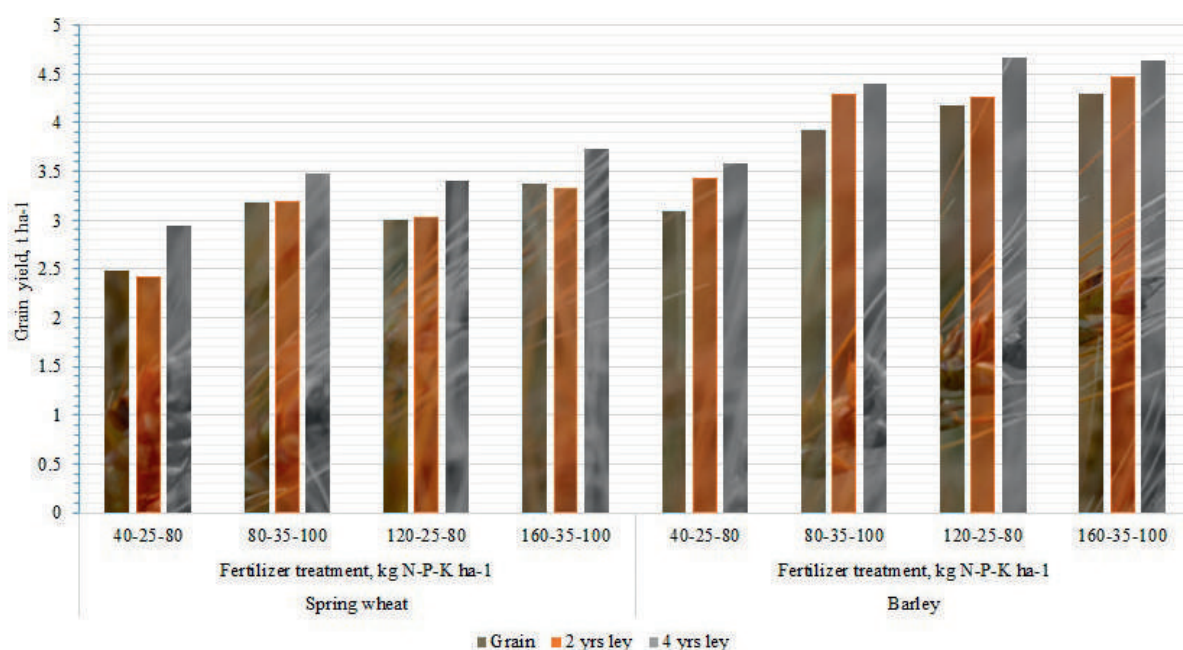
Since the 1950s, Norway's agricultural policies have promoted regional specialisation based upon soil quality and suitability (Culas & Mahendrarajah, 2005). Consequently, the best soils of central and eastern Norway are reserved for crop production, while animal husbandry dominates the marginal land in the west and north. One aim of this land-use policy is increased grain production (Hegrenes et al., 2002). Moreover, it is assumed that regional specialisation is necessary to reach two political aims: food security and agriculture on marginal land (Norwegian Department of Agriculture and Food, 2011). Therefore, few question the policy's agronomical consequence of mono-cropping (Vatn, 1989). However, grain yields have been declining for almost two decades (Abrahamsen et al., 2013). Although there are several political, economic,

genetic, climatic and agronomic reasons for yield decline (Brisson et al., 2010; Hoel et al., 2013), productivity is linked to soil fertility, which declines through mono-cropping. Hence, regional specialisation hinders rather than promotes increased grain production. Therefore, Norwegian agricultural policies should focus on soil fertility. Instead of supporting regional specialisation—and maximising short term *production* via mono-cropping—policies should promote long term *productivity* through crop rotation and integrated crop–livestock farming.

Integrated crop–livestock farming increases grain production. Due to limited land resources, a future increase in grain production depends on increased productivity (yield per unit area). As productivity depends on soil fertility, researchers are concerned about diminishing soil fertility in intensive cropping systems around the world, indicated by a decline in soil organic matter (SOM) (Carter, 2002; Chilcott et al., 2007; Laishram et al., 2012; Manlay, Feller, & Swift, 2007; Paustian, Elliott, & Carter, 1998; Reeves, 1997; Riley & Bakkegard, 2006). Over time SOM declines in mono-cropping systems, while in crop rotations with perennial grass (ley), SOM persists or even increases (Cuvardic et al., 2004; Havlin, 1989; Persson & Kirchmann, 1994; Reeves, 1997; Riley, 2012; Uhlen, 1991). As a result, crop–ley rotations improve grain productivity (Fig. 1) (Bell, Moore, & Kirkegaard, 2014; Franzluebbers et al., 2014; Nevens & Reheul, 2001; Uhlen, Kolnes, & Thorbjørnsen, 1994). To exploit the fodder produced in a crop–ley rotation, the most relevant farming system is integrated crop–livestock farming.

A misconception is that re-introducing crop–ley rotations would weaken food security (total grain production in Norway), because ley would occupy land suitable for grain production. Though specific farms would produce less grain, overall grain production could increase (Arnoldussen et al., 2014). This approach assumes crop–ley rotations wherever applicable, on current grain land as well as in animal husbandry areas. Hence, decreases in grain production on cropland would be outweighed by grain production in animal husbandry areas and a general in-





Figur 1. Effect of rotation and fertilisation on grain yields. Mean dry matter grain yield of spring wheat and barley (tons per hectare), in three different six-course rotations (continuous grain; containing 2 years or 4 years of ley), with different fertiliser treatment (kg N-P-K ha⁻¹), in 1981-92 in a long-term experiment on clay loam at Ås, Norway. LSD, 0.05, for rotation- fertiliser combinations 0.26 t spring wheat ha⁻¹ and 0.31 t barley ha⁻¹. Data from Uhlen, Kolnes & Thorbjørnsen (1994).

crease in grain productivity.

Another misconception is that dairy farming is the only way of exploiting the fodder produced in a crop-ley rotation. If dairy farming were to be re-introduced to eastern and central Norway, for example by abolishing the regional milk quotas, the consequence would be less competitive agriculture in marginal areas where production is more troublesome and costly. In the worst case this could wipe out agriculture on marginal land. In order to protect agriculture in these areas, other livestock than dairy cattle, e.g. sheep or beef cattle, could be used in eastern and central crop-livestock farming.

Instead of maximising short-term grain

production (total grain yield), it is vital to maintain long-term soil fertility to increase *productivity* (per land unit). This long-term perspective should be applied by policy makers to improve and sustain soil fertility, because soil fertility is an important public concern (Bonaudo et al., 2014; Peyraud et al., 2014). Current policies support regional specialisation through production quotas, taxation, subsidies and prices (of products and production). A successful revision of these political tools could reach several goals simultaneously: food security, agriculture on marginal land, sustainable soil management, and improved grain productivity.

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Hopeful Monsters: Evolutionary Relevance and Ecology of Polyploid Plants in the Arctic

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Polyploidy is a bizarre phenomenon whereby a large amount of genetic material accumulates within the nucleus of a single cell, forming utterly complex genomes. Plants in particular tend to be extremely variable in genome size and withstand more dramatic mutations than animals. Whole genome duplication forms polyploid gametes and individuals. It is quite common in flowering plants, whereas it is observed only in a few animal species. Yet, polyploid plants occur naturally and are the rule rather than the exception in alpine or polar habitats such as the Arctic. It is difficult to understand why the multiple genomes per cell are not reduced, even though selection forces against polyploids are so strong.

The purpose of this paper is to discuss the ecological and evolutionary significance of polyploids and to give a brief explanation of how polyploids are formed and in which ways polyploidisation influences the ecology of flowering plants in general. This paper will also discuss the role polyploids play in the evolution of higher plants before accounting for the relevance of polyploids in arctic ecosystems in particular. Ultimately, I discuss possible explanations for the frequency of polyploids in the circumarctic flora and describe their role as genetic buffers which counteract genetic pauperisation in glacial periods.

Genetic Mechanisms of Polyploidy

The heritable condition of possessing more than two complete sets of chromosomes is called polyploidy. This is contrary to haplo- and diploid cells: Tissues or organisms that have one or two complete sets of chromosomes respectively. The total number of chromosome sets tends to be highly variable in polyploid flowering plants, but it seems that even numbers of chromosome sets are the most common (Comai, 2005).

Pathways leading to the formation of polyploids are numerous, but can be divided into two major categories based on the origin of the different chromosome sets. Commonly, duplication of a genome within or between populations of a single species is referred to as autopolyploidy, whereas the condition of bearing two or more chromosome sets of different evolutionary origin is called allopolyploidy (Comai, 2005; de Wet, 1971). Allopolyploids may form by hybridisation between two polyploid races, ecotypes, or species that often originated from hybrids themselves (Comai, 2005). Formation of polyploids is quite common among angiosperms at an estimated frequency of 1 per 100,000 (Ramsey & Schemske, 1998). Physical factors, such as extreme shifts in temperature or exposure to toxic substances, are able to inhibit reductional division or induce polyploidy in somatic cells

by acting upon the plant, especially in vegetative tissues (de Wet, 1971; Tischler, 1942). Many errors can occur in vegetative parts, due to the high number of cell divisions taking place. This will subsequently lead to mitotic failures, eventually causing the formation of polyploid ramets that can become independent from the mother plant and may start to reproduce sexually (Ramsey & Schemske, 1998). This can be confirmed by the fact that the frequency of polyploids is highest in plant families where vegetative propagation by runners, stolons, or root sprouts is common (Ramsey & Ramsey, 2014), like Rosaceae (rose family) and Poaceae (true grasses).

Polyploidy in the Arctic

The frequency of polyploid plants is particularly high in the Arctic. This vast, environmentally challenging biome is characterised by a harsh climate and low biodiversity. Arctic flora is known to be sensitive to climatic oscillations, such as repeated glaciations, changes in temperature and resource availability (Brochmann et al., 2004). It is, for example, known that plants follow the movement of retracting glaciers and that the composition of Arctic plant communities that have persisted for a long time can change rapidly following sudden changes in average temperature (Eidesen et al., 2013).

Arctic plant species are generally widespread and known to have an intricate evolutionary history. Highly self-pollinating and inbreeding plant populations are common; evolution of Arctic plants is driven mainly by hybridisation and whole genome doubling (Brochmann et al., 2013). It is estimated that 73.7 percent of all species of mainly and exclusively Arctic taxa are polyploids (Brochmann et al., 2004). Large-scale phytogeographical studies in the 1940s revealed that the amount of polyploids among flowering plants is correlated with distance from the equator (Lynch & Conery, 2000; Löve & Löve, 1943). More DNA is found per individual with increasing latitude, in spite of a drastic decrease in overall number of species from the equator to the poles (Bennett, 1976; Brochmann et al., 2004; Löve & Löve, 1943).

Polyploid Ecology

Polyploids generally share great morphological similarity with diploids, but they tend to occur in more extreme environmental conditions and climates than their diploid counterparts (Lewis, 1966; Ramsey & Ramsey, 2014). Polyploids usually occupy niches where the exposure to physical stress is high, for example in extremely wet and halide marshes, alpine areas or other hostile environments such as the Arctic (Hagerup, 1932). This indicates greater environmental adaptability compared to diploids. Furthermore, polyploids tend to be perennial rather than annual, spend more energy on growing and multiplying vegetatively (Gustafsson, 1948) and are commonly associated with a greater tendency to bypass sexual reproduction by self-pollination or apomixis (Comai, 2005). These features are greatly beneficial in the Arctic ecosystem. They increase the invasiveness of polyploids, which makes them well equipped to expand into and colonise new habitats (Weiss-Schneeweiss et al., 2013). De novo formation of polyploids poses an important problem, since the whole process of genome duplication often happens in the habitat of the parental diploids. Once it has become a polyploid, an individual needs to compete immediately with its progenitors (de Wet, 1971). Thus, invasiveness should be seen as a trait not only associated with polyploidy but moreover as a characteristic that is selected positively amongst polyploids (Soltis & Soltis, 2000).

Trade-Offs Associated With Polyploidy

The metabolic costs of possessing and maintaining an enormous genome such as in polyploids are huge. Bigger genomes require more energy during each round of genome replication during the synthesis phase in the eukaryotic cell cycle. Naturally, this process takes longer in polyploids than in diploids, leading to generally slower growth rates in plants that have undergone genome doubling (Otto, 2007). High chromosome numbers give rise to many possible difficulties in meiosis or mitosis, resulting in disorganised segregation or even loss of chromosomes during cell division (Comai, 2005). This is an issue es-

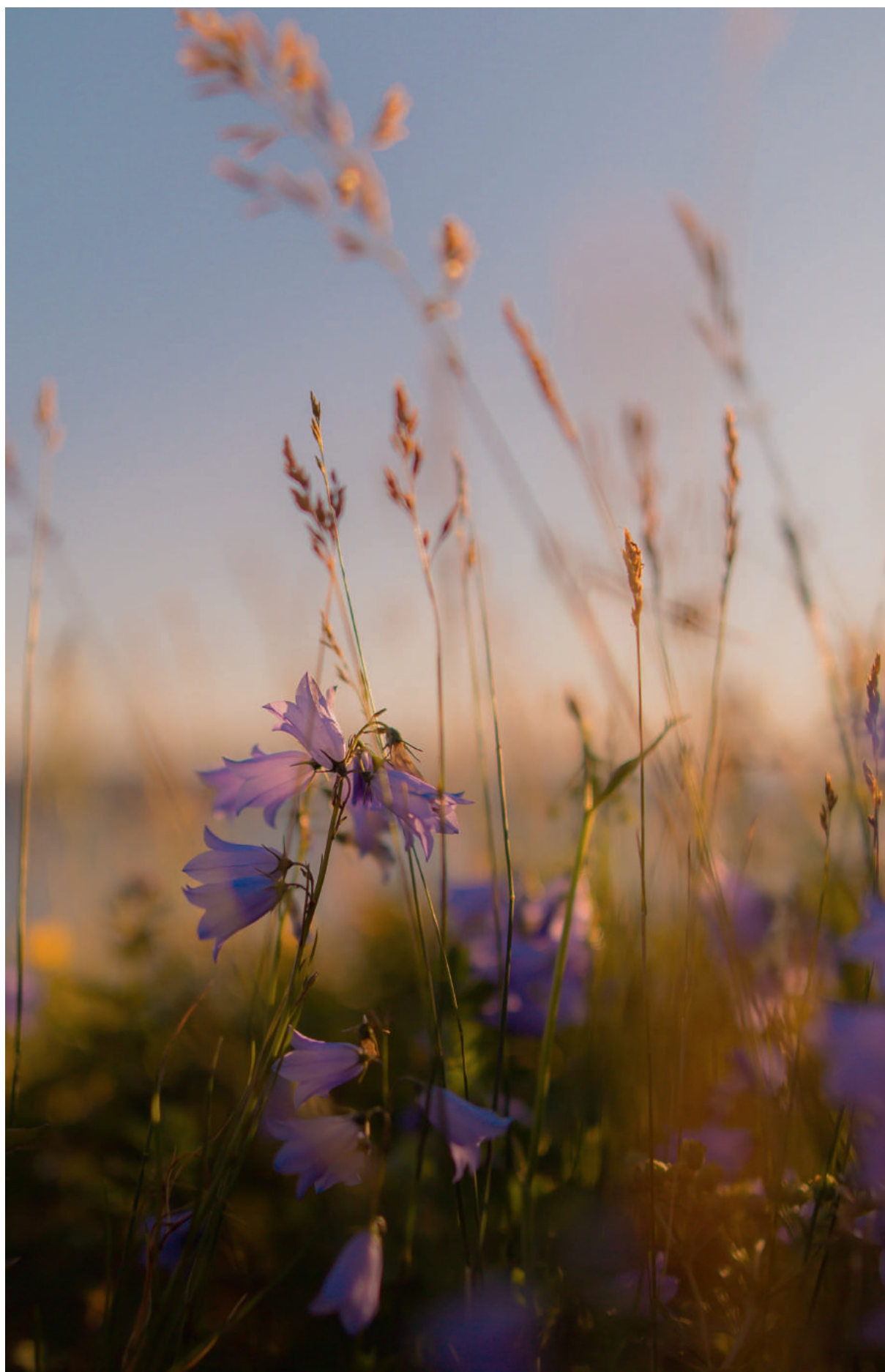
pecially for anorthoploid individuals having an uneven number of chromosomes. It is thought that plants having an odd number of nucleic genomes are doomed to an evolutionary dead-end of infertility, due to their inability to form gametes that contain a stable amount of genetic information (Comai, 2005; Otto, 2007). Moreover, polyploidisation increases the number of non-coding DNA. This, in some cases, can be involved in gene regulation, resulting in metabolic irregularities caused by interaction of the different genomes leading to improper expression of genes in different developmental stages (Adams & Wendel, 2005). Thus, it seems puzzling that polyploids are more abundant in the Arctic and other extremes than in more hospitable environments where resources are scarce.

Duplication of a diploid genome entails that every gene is present twice per cell, causing high redundancy of genes (Comai, 2005). Thereby, polyploid populations maintain a higher number of heterozygotes than diploids. Heterozygosity has the advantage that deleterious or recessive lethal alleles are masked by dominant, functional ones. Highly polyploid and heterozygote populations tolerate higher levels of self-fertilisation (Soltis & Soltis, 2000). This effect is very important in populations where the effective population size is small and inbreeding is common: a small effective population size favours the loss of alleles by random genetic drift. Polyploidisation can buffer this effect by maintaining high genetic diversity in areas where introduction and maintenance of new genetic variation by gene flow and sexual reproduction is a rare event. This is a demanding issue in the Arctic. Practical absence of seed dispersal vectors and pollinators paired with low rates of seed survival strongly select for vegetative spread and asexual reproduction, which is often entirely clonal or apomictic (Brochmann et al., 2004). Moreover, heterozygosity leads to heterosis, which means that higher performance is shown by a hybrid compared to its progenitors (Comai, 2005). Especially the effect of genes that act in a dose-specific manner is amplified by a great magnitude, simply because of the higher number

of gene copies available to expression (de Bodt et al., 2005). Extra gene copies provide a canvas for experimentation when it comes to adaptability and evolution (Comai, 2005). Some gene copies can retain their original function whereas others mutate and are sacrificed to natural selection if not positively contributing to the individuals' fitness. It is important to note that no new genes are added to a population by any kind of polyploidisation event. This does not necessarily need to be a disadvantage. In fact, the formation of polyploids provides "genetic continuity" (de Wet, 1971) to populations that are in danger of losing their environmental adaptations by intermixing with distant populations, a phenomenon known as outbreeding depression. Arctic ecosystems demand a high degree of specialisation, such as cold tolerance and a well-timed life cycle, due to the short growing season. Gene pools of northern Arctic plant populations can be contaminated by invaders or pollen from southern or subarctic populations adapted to milder environments, thus weakening the hardiness of their relatives.

Polyploidy and Evolution

Recent large-scale molecular studies conducted on several angiosperm genomes revealed the importance of polyploidisation on plant evolution by displaying that the fraction of recent angiosperms whose ancestors underwent whole genome duplication once in the past is much higher than anticipated. It has been shown that so-called paleopolyploids are found in great number throughout all angiosperm families and genera, and support the hypothesis that the entire angiosperm lineage diversified during a series of polyploidisations around the Cretaceous–Paleogene boundary extinction event, roughly 66 million years ago (Linder & Barker, 2014; Vanneste et al., 2014). This is consistent with the theory of polyploids as good invaders and colonisers that form in situations of severe physical stress (Linder & Barker, 2014; Vanneste, Maere, & van de Peer, 2014). This provides an idea of what kind of environmental conditions may have ruled the earth in a time where many taxa



were wiped out completely. More recent paleopolyploidisations happened during later major environmental shifts such as the expansion of steppes in the Miocene (Estep et al., 2014), particularly in true grasses (Poaceae). Polyploidy is, in that way, an important driving force in plant evolution. The fact that it primarily is preserved in the Arctic accredits this region great importance for plant evolution (Brochmann & Brysting, 2008).

Although most of the recent plant lineages developed from polyploid ancestors, many diploids are found among recent angiosperms. Obviously, lots of genetic information has been lost over time and polyploids gradually evolved back into diploids. What was the fate of these duplicated genes? As previously mentioned, maintenance of huge genomes is incredibly resource demanding and thereby very costly. Eventually, duplicated genes or even entire chromosome segments are merged together or lost unless they are essential in gene regulation or acquire new functions by mutation (Adams & Wendel, 2005; de Bodt, Maere, & van de Peer, 2005). Selection favouring the most effective genomes will thereby reduce ploidy level, gene redundancy and downsize genomes over time. Thus, retained genes will rearrange and chromosome sets will merge until diploidy is restored (Lynch & Conery, 2000; Soltis et al., 2014).

Discussion

It has been suggested that polyploids are more adapted to extreme climates and show greater hardiness than diploids (Hagerup, 1932; Tischler, 1942). The most straightforward explanation is that polyploidisation itself causes greater resistance to the harsh climate ruling the Arctic (Löve & Löve, 1943). The formation of polyploids is thereby thought to be an evolutionary strategy diploids are forced to make use of when the environment becomes hostile (Stebbins, 1984). This hypothesis implies a strong correlation between latitude and plants with duplicated genomes, also within the Arctic. However, several highly Arctic areas do not show this distributional pattern at a smaller scale. Alaska is such an example. There, frequency and degree of polyploidy is highest in southern and central habitats, whereas northern regions around

the Bering Strait are rich in diploids (Johnson & Packer, 1965). In fact, polyploids are mostly found in areas recently uncovered by ice. These provide niches with difficult growing conditions: wet, unstable and severely disturbed soils with a fine texture as well as shallow permafrosts (Johnson & Packer, 1965). This suggests that it is the degree of previous glaciation that primarily determines the frequency of polyploids in the Arctic (Stebbins, 1984).

Recurrent glacials eradicate vegetation in vast areas thereby separating populations from each other, a process generally known as vicariance. As a consequence, the populations adapt independently to different environmental conditions in spatially separated refugia, diverging into different ecotypes, races or even species. Glacial expansion followed by separation of populations is a form of bottleneck event. Only a few individuals survive the disruption event, leading to little genetic variation in the respective populations that survive in ice-free refugia (Brochmann et al., 2004). Severe inbreeding and loss of genetic variation by genetic drift can be counteracted by increasing the amount of genetic diversity carried per individual. Genetic buffering can be exemplified by the Arctic grass *Duon-tia fisheri* s.l., which is a species complex from which hexaploids ($2n = 6x = 42$ chromosomes), dodecaploids ($2n = 12x = 84$) and even decaoctoploids ($2n = 18x = 126$) are reported (Brysting et al., 2004). Individuals from all ploidy levels are found in the same areas, indicating that the entire Arctic was first colonised by hexaploids, which constantly form higher polyploids in habitats they occupy during interglacials. Because *D. fisheri* is the result of an allopolyploidisation (Brochmann et al., 2004), no recombination is happening between the different genomes of this plant, which in the long run has led to fixed heterozygosity.

During interglacials, secondary contacts between these polyploidal populations become established in contact zones vacated by ice. Previously separated populations start to intermix again, leading to the formation of autopolyploid hybrids. Polyploidy facilitates not only the persistence of rare alleles against glaciation, but also the formation of entirely new species when the living conditions for plants turn to the better.

One example of such a recently emerged, allo-tetraploid hybrid species is the Oslo Saxifrage (*Saxifraga osloensis*). The distribution of this species is limited to the contact zone of its parental diploid parents, *Saxifraga adscendens* and *Saxifraga tridactylites*. It is believed that *S. adscendens* and *S. tridactylites* survived the last glaciation in separate refugia in continental Europe. When the ice retreated, both species expanded northwards to Scandinavia and hybridised there, eventually resulting in the newly formed *S. osloensis* (Brochmann et al., 2004).

The impact of vicariance events such as glaciations on the frequency of polyploids and ploidy level can also be demonstrated on a large scale covering the entire Arctic. In North America, angiosperm taxa restricted to the areas around the Bering Strait are richer in diploids than plants restricted to the previously glaciated region bordering the Atlantic Ocean (Brochmann et al., 2004). Beringia acted as a refuge during the glacials of the Pleistocene where plants, both di- and polyploids, were forced to retreat to during cold periods (Eidesen et al., 2013). The higher ratio of polyploid to diploid taxa in the Beringian region indicates that it was particularly polyploid individuals that re-colonised the Atlantic region after the ice sheets retracted northwards. Studies conducted on polyploid model organisms indicate that long distance dispersal is a trait that might be associated with whole genome, however the ultimate cause for why polyploids seem to be better colonisers and invaders still remains to be revealed (Linder & Barker, 2014). Polyploidy may lead to increased masking of disadvantageous or

even lethal alleles and better adaptability to new ecological conditions due to greater amounts of genetic material and hence greater variation in plant metabolism (Linder & Barker, 2014; Soltis & Soltis, 2000). Climatic oscillations contribute in that manner not only to the regional extinction of plants, but also to the maintenance of considerable genetic variation by favouring the formation of polyploids and creating niches they can invade (Brochmann & Brysting, 2008; Brochmann et al., 2004).

Conclusion

The study of polyploids is crucial to understanding the mechanisms that formed the circumpolar flora. It is the degree of glaciation during the last ice age and the position of regions that acted as refugia during glacials which has to be considered in order to explain distributional patterns of polyploid plants within the Arctic. It was in Arctic refugia that polyploids persisted during ice ages as “hopeful monsters” that escorted genetic information through bottlenecks. During times of severe inbreeding, polyploids maintained genetic diversity, thus keeping the Arctic flora from genetic impoverishment. Arctic polyploids are of great importance for the flora of the northern hemisphere and demonstrate that ample amounts of genetic diversity exist above the polar circle. In a time where global warming threatens the existence of the Arctic ecosystem, it is important to develop conservation strategies that stress the role of polyploids as an evolutionary motor. Safeguarding polyploids and their habitats ensures that their plentiful genetic diversity will be carried on into the future.

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Upper photo: Thea Willoch Njaastad
Lower photo: Aslak Bjørge Hermstad

Letter

Neo-Colonialism in Western Sahara and East Timor

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Although most colonies gained independence during the mid-20th century, some struggled to become sovereign. In 1975, Western Sahara and East Timor were violently invaded by Morocco and Indonesia, respectively. Both invaders justified their actions by claiming historical rights to the territories, but both claims conflicted with international law for violating the basic human right to self-determination (de Weichs de Wenne, 1996). Despite these similar beginnings, East Timor became independent in 1999, while Western Sahara remains occupied. To determine why they are currently in such different positions, neo-colonialism in the two countries is compared using three geopolitical characteristics: the influence of the Cold War, the discovery of natural resources, and the support of UN Security Council members.

During the Cold War, in 1975, both invaders were allies of the US, which supplied them with billions of dollars in military aid (Orenstein, 2002; Zoubir, 2007). Morocco was a reliable, anti-communist ally in the Arabic world, and Indonesia played a similar role in South-East Asia—especially after the conflicts in Korea and Vietnam. In return for Morocco's and Indonesia's support in the Cold War, the US

supplied military aid whilst ignoring their violations of international law. Although the Cold War ended and its influence on international relations diminished, the occupations continued because the invaders discovered valuable natural resources and moved to expand favourable trade relations with the West.

Extracting and trading natural resources strengthened support from influential trade partners beyond the US. France has historical ties with Morocco, its former colony, and the two countries maintain a strong political relationship. Since Western Sahara's occupation, France has repeatedly emphasised its solidarity with Morocco (Zoubir, 2007). In exchange for this support, Morocco has allowed French corporations to exploit the abundant phosphate and fishery resources found in Western Sahara (Armstrong, 2014). When Morocco started oil exploration in 2001, they secured exclusive drilling rights for the French oil company, Total. Likewise, Indonesia promulgated exclusive resource rights to Australia. In The Timor Gap Treaty, Australia formally recognised Indonesia's rule over East Timor in exchange for oil and gas rights beneath the Timor Sea (Hainsworth, 1997). These bilateral trade alliances helped stall

independence movements because of French and Australian influence within the UN.

In particular, permanent members of the UN Security Council, can use their veto right to influence self-determination initiatives in contested territories. France's permanent position in the Security Council has largely blocked intervention in Western Sahara. The Security Council decides where, when, and how the UN acts, such as by sending peacekeeping forces; their support, therefore, is vital for newly emerging states. In 1991 the Security Council passed a resolution to carry out a referendum on self-determination in Western Sahara (Bank & van Heur, 2007). The resolution appointed the United Nations Mission for the Referendum in Western Sahara (MINURSO) to carry out a referendum in 1992, but voting has yet to take place. Morocco has postponed, stalled and hindered a fair referendum in many ways. Moroccans are, for example, encouraged by the government to move to Western Sahara in an effort to dilute the Saharawi population, thus skewing the outcome of a referendum (de Weichs de Wenne, 1996). Most importantly, however, Morocco continues to object to the terms of UN-supported referendum initiatives. The government refuses to consider giving Saharawis independence; instead, it argues that the territory should have "large autonomy" or full integration within the Moroccan Kingdom (Zoubir, 2007). Morocco set a precedent for cooperation and gave itself a strong legal position by initially agreeing to the referendum, while France's veto in the Security Council has successfully blocked international intervention. A media blackout in the occupied area, executed by the Moroccan government by denying foreign observers entry into Western Sahara, prevents international press from reporting on violations against human rights (de Weichs de Wenne, 1996). For example, a group of human rights activists from Norway—NMBU students among them—were expelled from the country

in January 2016. Moreover, the blackout policy effectively prevents public news media from reporting about the invasion and quells Saharawis' demands for a just referendum.

Indonesia, on the other hand, did not have an ally in the Security Council, so the Timorese could publicise the crimes Indonesia committed throughout their struggle for peace and independence. The media coverage and political lobbying that followed the Santa Cruz Massacre of 1991 particularly heightened global awareness of conflict in East Timor (Taylor, 2012). For drawing international attention to Indonesia's repressive activities, two East Timorese leaders, Bishop Carlos Belo and Jose Ramos-Horta, received the Nobel Peace Prize in 1996. Moreover, public opinion in countries that supported Indonesia—especially in Australia and the US—grew increasingly critical of the regime. Under pressure from the public, governments of these influential countries used threats of strong sanctions to persuade Indonesia to organise a referendum for the Timorese. In 1999 the referendum passed, with an overwhelming majority voting for an independent Democratic Republic of Timor-Leste.

Western Sahara and East Timor share historical roots, but different contemporary developments have shaped the diverse outcomes of the neo-colonial occupations in these two nations. For Morocco, plentiful natural resources and a colonial link to France has assured the support of this UN Security Council member, which has repeatedly blocked the UN's efforts to hold a referendum for independence. This permanent backing, along with the media-blackout on this issue, explains why Morocco remains the "administering power" over Western Sahara. Indonesia, however, lacked enduring support from UN decision-makers, so it had little choice but to surrender under overwhelming global empathy for the Timorese.



Photo: Tess Espey

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Photo: Torunn Bråna



Food Safety in Norway Today

An Assessment of Relations to
Foodborne Diseases

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According to the Human Development Report, Norway had the highest score of all countries in 2014 (United Nations Development Programme, 2014). The country's high scores in categories like income distribution and equality show that most individuals in Norway can access and purchase food that meets their daily needs. Shops carry many different varieties of vegetables, fruits, meats, drinks, sweets, and other groceries all year long. In fact, few countries have better food security and safety than Norway (Global Food Security Index, 2015b). The World Health Organization (WHO) explains that true food security "exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active lifestyle" (WHO, 2015). Though the food industry provides consumers access to a variety of food choices, Norwegians are not as healthy as one might expect.

Norway has strikingly high rates of illnesses that correlate to poor diet and harmful food additives. Globally, it has among the highest per capita occurrences of prostate cancer, testicular cancer, bowel cancer, skin cancer, diabetes, asthma and allergies. Norway also has some of the poorest sperm quality in Europe, and every seventh Norwegian couple is struggling to conceive children (Geelmuyden, 2013). Moreover, the country's good scores from indices that rank food systems can be deceiving. Out of 109 countries profiled by the Global Food Security Index, Norway ranks as tenth on affordability and availability, and eleventh on safety. However, the index fails to account for chemicals in food products; instead, its criteria focus on the "existence of agency to ensure health/safety of food; access to potable water; [and] presence of formal grocery sector" (Global Food Security Index, 2015a). But in reality, Norwegians have more toxins in their bodies than people from any other country in the world due to food, cosmetics, household products, air pollution, and water pollution (Tande-Nilsen, 2014). Although Norway enjoys a reputation of being among the best places to live in the world, consumers' health and well-being is threatened by poor dietary choices and by biased decisions from food-regulating agencies.

Historical Background

As a part of the European Economic Area (EEA), an agreement that ensures free trade between member states, Norway must ensure that its food systems comply with regulations defined by the European Union (EU). These rules ultimately aim to ensure safe production of food through policies targeting animal health, animal welfare, labelling, and risk assessment, including all steps from food production to retail (Regjeringen, 2015). The European Commission (EC) makes standing decisions regarding what is imported to and exported from the EU (European Commission, 2016). The European Food Safety Authority (EFSA) is an independent agency within the EU that uses current research to evaluate food-related risks. It assesses the risks of pesticides and additives used in food production and legislates other threats to consumer safety. Furthermore, the EFSA closely monitors diseases associated with food, such as epidemics, allergies, cancer, and cardiovascular diseases to ensure safe import and export of food products (EFSA, 2015b).

By looking into the history of the EU and the establishment of the EFSA, one gets a clearer picture of the current situation in Norway and how it might develop in the future. After the Second World War, Europe prioritised quantity over quality to feed the population, and the founding of the European Economic Committee (EEC)—now the EU—in 1951 made trade easier between member states. Because there were few regulations on livestock production, animal disease problems frequently became international issues. Large outbreaks such as tuberculosis and foot-and-mouth disease prompted the EEC to regulate improvements in animal welfare across member states because poor hygienic conditions were often the main reason for epidemics (EC, 2007).

The EEC faced an even broader spectrum of food safety challenges when Norway and the rest of Europe transitioned to more intensive agriculture. In the 1970s, farmers began to use synthetic pesticides to increase and maintain crop yields. Because pesticides can be dangerous to humans, the EEC put restrictions on maximum tolerable residue levels in food and required that pesticides were approved before

use. With increasing globalisation through the 1980s, the EEC tried to ensure that all links in food production chains also met strict standards to maintain food safety. However, Europe still experienced several food-related scandals during these decades, including the discovery that growth-hormones in meat affected children's growth rates (EC, 2007). An outbreak of bovine spongiform encephalopathy (BSE), or mad cow disease, during the 1990s significantly raised awareness about and drew criticism toward food safety in Europe (Rykkja, 2008). This event motivated the EEC to upgrade its whole system by requiring the livestock industry to do group or individual identification and labelling on animals to ensure full traceability on all batches of meat products. In 2002, the EFSA was established to work as a consulting agency regarding food safety (EC, 2007).

Regulations and Restrictions

The EFSA is a relatively young agency, but it has done critical work in improving various aspects of food safety in Europe. However, in a publication titled "Conflicts on The Menu," Corporate Europe Observatory (CEO) (2012) claims that the EFSA is subject to lobbying that ultimately leads the agency to making assessments in favour of industry, rather than consumers. They have been found to ignore independent studies, and they have permitted industries to compile studies that influence EFSA decisions, which was the case for the tobacco industry as well as for concerns over Bisphenol A (BPA). Additionally, some of the EFSA board members are employees of Coca-Cola, Nestlé and BP, tainting their supposedly independent research (CEO, 2012).

In addition to the EC and EFSA, food safety in Norway also falls under the jurisdiction of the Norwegian Food Safety Authority (NFSA), which has responsibility over laws, regulations, and restrictions related to food, animal health, animal welfare, and food packaging (Mattilsynet, 2013). The EFSA, however, still controls pesticide use in food production and the EC regulates the import from outside of member states. A problematic, and controversial, aspect of the control of pesticides is that the EC often allows the import of pesticide residues that

are not allowed in Norwegian agriculture. Double standards like this are unfair to consumers, but even more so to Norwegian farmers who operate under strict pesticide legislation. The nation's farmers must constantly compete against imported products because among all European countries, Norway imports the second largest proportion of its domestic food supply (Tande-Nilsen, 2014).

The EFSA and NFSA also control the maximum residue levels for chemicals that come from food production and modification. Both the EFSA and the NFSA do assessments to check that these amounts are safe for consumers to ingest. Unfortunately, chemical levels are controlled separately; the food safety agencies do not take into account that people ingest multiple chemicals every day, creating a cocktail effect. Today, 200 to 400 toxic chemicals are found in Norwegians' body tissues, coming from food and other sources (Tande-Nilsen, 2014). Every year, the NFSA does random spot checks to evaluate residue levels. If a product contains too much of a chemical known to be harmful, the NFSA will immediately remove it from the market (Mattilsynet, 2012). However, the NSFA has repeatedly increased acceptable residue levels in food and continues to propose raising these levels even higher. For example, the proposal to increase acceptable glyphosate levels in lentils by 100 times was approved in 2012 to allow imports from the US and Canada. These proposals are motivated by opportunities for Norway to open up trade with other countries that have looser restrictions on pesticide use (Tande-Nilsen, 2014).

Organic and Conventional Food

Norwegian culture and eating habits are important factors in the way people select, consume, and demand food products. Often Norwegians do not make meals completely from scratch; instead, they buy a lot of processed and premade food that often contain additives, preservatives, and few nutrients. Though Norwegians perceive food as being very expensive (Ellefsen, 2015), they actually spend only 12 percent of their income on food (Statistics Norway, 2013). In contrast, people in many developing countries spend more than half their income on food (Food and Agriculture Organization, 2011). Many Norwe-



Photo: Mariann Midbøe

gians still claim that they cannot afford—or do not want to spend money—buying fresh, local, and organic food (Ellefsen, 2015).

From 2013 to 2014, organic food sales increased by 30 percent, showing greater demand for and interest in more sustainable food options (Oikos, 2015). However, compared to Denmark, Sweden, or the rest of Europe, the demand for and supply of organic products in Norway is still relatively low. Norwegians generally have confidence in their government, believing that the authorities would intervene in case of unsafe food; therefore Norwegians generally trust the food available in grocery stores (Berg, 2000). Because organic food is often more expensive, they see no economic (or nutritional) value in choosing organic options (Ellefsen, 2015). This trend may slowly be changing because the demand for (and consequently the supply of) organic foods is gradually increasing.

Popular media can also influence Norwegians' opinions on the relative merits of organic versus conventional food options. In 2014 the Norwegian Scientific Committee for Food Safety (NSCFS) issued a comparative report called "Comparison of Organic and Conventional Food and Food Production." The NSCFS found that organic food had less pesticide residue compared to conventional food, but that neither type of food exceeded maximum residue

levels. The report also featured comparisons on plant health, nutritional value, hygiene and animal welfare, indicating that organic food and production were superior in most evaluation categories (Norwegian Scientific Committee for Food Safety, 2014). However, when major news networks like NRK (Risberg, 2014) and VG (Bodil & Larsen-Vonstett, 2014) covered the findings from the report, their main conclusions were that organic food was generally better than conventional food, but not to the extent that it should determine consumers' purchasing habits. Stories like this have caused Norwegian consumers to reconsider paying extra money for organic products.

Chemicals in Food

In non-organic foods, chemical additives, when ingested over time, can cause chronic health problems among consumers. However, assessing and determining the consequences of continuous low exposure is problematic, because many substances and stressors can contribute to illness and disease. Main impacts include irritated skin, eyes, or airways, but most worrisome is the damage caused to cellular and molecular structures in our bodies, namely: DNA, hormones, metabolic reactions, and enzymes (Norwegian Scientific Committee for Food Safety, 2013). Moreover, endocrine disruptors can cause puberty and

menstruation to occur earlier or may stimulate testicular cancer. For example, glyphosate, the most widely used herbicide in Norway and the world, may cause birth defects and enhance the risk of cancer (Holten, 2016). Moreover, asthma and breathing difficulty make people vulnerable to poor air quality and, with related complications, can lead to premature death (Geelmuyden, 2013).

The EFSA, however, has given surprisingly little attention to addressing chronic and synergistic effects of food-borne chemicals. The aforementioned CEO (2012) report, “Conflicts on The Menu,” criticises the EFSA for not testing the long-term effects of certain chemicals or chemical mixtures in foods. The EFSA routinely performs assessments with high chemical exposures in order to establish acceptable daily intake levels, but these assessments overlook low and continuous exposure, which is how most consumers ingest substances over time. There is no special consideration for vulnerability during different life stages—for instance, pregnant women or young children. Sometimes it can take years before a substance or chemical is labelled as high risk and is banned from the market, allowing consumers to suffer from the ill effects of exposure for a long time (CEO, 2012).

On the other hand, the NSCFS claims in their report titled *Combined Toxic Effect of Multiple Chemical Exposure* that the cocktail effect is not a big problem in Norway. It recognises that the impacts of combined exposure have not yet been well researched, limiting its overall assessment. In the report, the NSCFS says that because substances have distinct health consequences, combining them will likely mean that most stressors remain below the acceptable daily intake levels. However, if one is exposed to substances that trigger similar symptoms, their effects may be compounded. The NSCFS concludes that there could be adverse health impacts from the cocktail effect, but it does not consider them to be serious risks (Norwegian Scientific Committee for Food Safety, 2013). But this agency does not have a substantial enough basis for its statements; it cannot explore the multitude of eating habits and food preferences among consumers, so it does not know whether

or not they consume substances with the compounding or unrelated health effects.

Besides being present in some foods since their production, harmful chemicals may leach from the cans, plastic cartons, and other types of packaging that are used to increase the lifetime of food by protecting it from bacteria and other pathogens. Packaging makes food safe to eat for longer, but some substances, such as perfluorinated compounds or BPA, pose distinct threats to consumer health. Some compounds disrupt hormones, especially in children, which can impose lifelong effects such as infertility problems or heart diseases (Geelmuyden, 2013). BPA, a building block in plastics, is frequently used in both plastic and metal packaging. Although the EFSA admits that residues of BPA from packaging are transferred into food products, it considers these residues safe enough to continue this substance’s use (EFSA, 2015a), despite BPA being a known endocrine disruptor and allergen (The Norwegian Environment Agency, 2015). The EFSA has repeatedly rejected or dismissed studies that have shown the danger of BPA, so the substance remains on the market. The EFSA did, however, remove BPA from baby bottles, recognising that babies can suffer more severe ill effects from exposure to many chemicals than their adult counterparts (CEO, 2012).

Meat Consumption Versus a Plant-Based Diet

Eating excess meat can also increase the risk of chronic health problems, implying that a diet which is rich in plant-based foods may be healthier for consumers. Eating plant-based foods decreases the risk of illnesses like BSE and *E. coli* poisoning (Geelmuyden, 2013) and, according to *The China Study*, it decreases risk of other long-term diseases like cancer and heart disease (Campbell & Campbell, 2006). Meat consumption can increase the risk of cancer, Alzheimer’s, arthritis, diabetes, and heart disease. These complications are especially relevant in Norway, where the average person eats twice as much meat as the Ministry of Health recommends (Geelmuyden, 2013). Norwegians, however, seem to be aware of the chronic risks of consuming red meat, often choosing to eat chicken and salmon instead. But these animals

are conventionally kept in small, crowded enclosures that make them stressed and sick, producing poorer quality meat for the people who eat it. In particular, fish farming practices in Norway require large quantities of antibiotics and chemical additives, but the NFSA still recommends that people include more fish in their diets (Geelmuyden, 2013).

Because of Norwegians' food preferences and eating habits, transitioning to plant-based diets may mean that individuals will not get sufficient nutrients. Considering that the supply for organic foods are still very low on a national level, vegetarians can still ingest chemicals from conventionally produced vegetables and from the packaging of their food. Norwegians currently eat fewer vegetables than the rest of Europe, far less than what the Ministry of Health recommends (Geelmuyden, 2013). But vegetables provide key health benefits, such as strengthening the immune system, releasing important vitamins and minerals and decreasing the risk of cancer and other diseases. If the same vegetables contain residual levels of chemicals that can cause significant health problems, however, assessing the net benefits of a purely plant-based diet is difficult (Norwegian Scientific Committee for Food Safety, 2013).

The overconsumption of some starches is also linked with diseases like colon cancer, so a plant-based diet would not exclude all chronic disease unless consumers thought more critically about balancing their nutritional requirements. For example, consuming lots of highly processed wheat can cause gluten intolerance and, over time, it can contribute to colon cancer because of lack of fibre and few nutrients (Geelmuyden, 2013). Because grains are largely products of industrial monoculture, they contain a lot of mould that is difficult to detect and remove during production and processing. Moulds can trigger inflammation in the colon, cause damage to the liver and kidneys, and suppress the immune system. Because Norwegians eat a lot of bread, pasta, and cereals, these health implications pose a grave threat (Geelmuyden, 2013). By becoming more aware of daily nutritional requirements and whole and organic food options, consumers can best ensure a healthy diet. Opti-

mal diets would emphasise organic options, including minimal meat, limited processed starches, and a wide variety of vegetables.

Conclusion

Though food safety in Norway has developed to resolve many critical challenges over the past decades, new obstacles continue to test the food industry and pose risks to Norwegian consumers. This is a continuous battle in the development of Norwegian society, but these obstacles need to be taken seriously at an early stage in order to prevent problems from amplifying in the future. Norwegian consumers have the onus to make key decisions and changes: They can amend unhealthy habits by avoiding processed and pre-made food. They can also eat healthier by including more vegetables and organic foods within more balanced diets. Ultimately, the supply in the grocery store is a reflection of consumers' demands. Increasing demand for local and organic food—a trend that continues to get stronger—will show food retailers what people want.

On the other hand, authorities must also work to keep the marketplace safe for consumers. Studying food-borne chemicals and the combined exposure to them may be a new field, but the EFSA has egregiously dismissed research that shows strong evidence of the dangers of cumulative, long-term exposure. Disturbingly, the EFSA and NSFA have repeatedly proposed increasing maximum acceptable residue levels in order to facilitate trade with new international markets. High standards of medical treatment in Norway may help to decrease incidences of premature death, but addressing the root causes of health problems is a far more proactive approach to ensuring long-term health in the country. Not only should food security agencies be working to improve their monitoring and assessment regimes to keep pace with new food-related issues, they should also keep consumers informed about important links between health and food products. Rather than pandering to corporate interests, food safety agencies like the EFSA and NFSA must ultimately place higher priority on protecting public health in order to keep Norwegians safe and informed.

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Photo: Tess Espey



Photo: Madelaine Bereza

Letter

Rock Dust as a Sustainable Source of Fertiliser

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As the world's population grows, food instability increases. Food instability influences international structures and threatens global growth and stability (Young, 2012); therefore, agriculture must generate increasingly high yields to meet current food demands. To do this, farmers fertilise to ensure the soil can support intensive cropping. However, the chemical fertilisers most commonly used are unsustainable, leading researchers to examine natural, alternative fertilisers such as rock dust. Rock dust should be increasingly used, as it mimics successful natural fertilising processes, has minimal adverse effects on the environment, is easily accessible, and has produced promising crop yields (Leonardos, Theodoro, & Assad, 2000).

Using rock dust as a fertiliser is an effective way to mimic natural fertilisation. When small pieces of rock are spread over land and allowed to naturally weather, nutrients are released from the rock, making the earth more fertile. The highly fertile river deltas of Vietnam, where up to 80 percent of the country's rice production is located, are but one example of this phenomenon (Cook & Tu, 2014). The Mekong and Red Rivers transport upstream sediments to the deltas and spread the nutritive pieces of rock

over the rice fields during flooding. The success of this natural process suggests that similar high-yielding results could be achieved by manually applying rock dust as a fertiliser.

In addition to increasing yields, fertilising with rock dust has minimal adverse effects on the environment. Rock dust contains no artificial materials and pollutes neither soil nor water. It enhances natural biodiversity, as it is able to strengthen plant life without weakening other components of the ecosystem (Leonardos et al., 2000). Additionally, rock dust can be purchased as a by-product from pre-existing industrial practices, which limits its environmental impact. Many huge industries such as mining and quarrying consider rock dust by-product to have little or no commercial interests. Therefore, as long as the source of extraction is close to the application site, the environmental damage related to extraction and application of rock dust will be minimal (Haller, 2011).

Despite the advantages of rock dust, many still argue that chemical fertilisers are more efficient. Chemical fertilisers release nutrients quickly, while rock dust has to weather naturally. Although rock dust takes longer to fertilise the soil, it provides far more sustainable

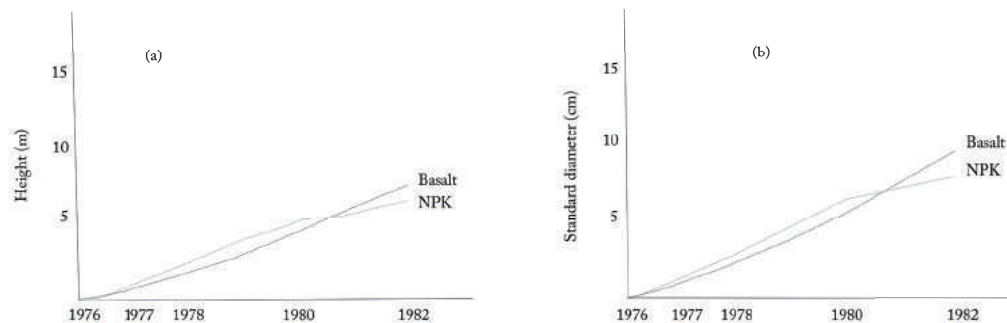


Figure 1. Adapted from Leonnardos, Fyfe, and Kronberg (1987, pg. 368) Height (a) and Standard Diameter (b) of Eucalyptus trees as functions of age (X-axis) and treatment: NPK (dotted-line) or basalt (dashed-line). Rock dust (basalt) more efficient in the long-term.

yields in the long run by slowly releasing nutrients and enhancing ecosystems (Leonnardos et al., 2000). Furthermore, the studies questioning rock dust's efficiency have primarily been short-term studies, while longer research periods are needed to determine rock dust's true potential (Hansen, 1981). Figure 1 compares the height and diameter of eucalyptus trees fertilised with rock dust from Basalt versus those of trees treated with a chemical fertiliser (NPK). The figure indicates that even though NPK was more efficient in the early years, over time, rock dust produced the highest yields.

Because rock dust is capable of giving high yields without significant environmental and economic costs, it potentially plays a key role in the move towards sustainable agriculture. Continuing the current fertiliser practices of mainstream agriculture and ignoring calls for sustainability will have devastating effects, as chemical fertilisers gradually ruin the ecosystems we depend on. Therefore, farmers should increasingly apply rock dust to promote high yielding and sustainable agriculture that would ensure food security for a growing population.

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The Reintroduction of Wood Bison in Alaska

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The wood bison (*Bison bison athabasca*) disappeared from Alaska around 100 years ago, recently enough that some elder natives still remember seeing and hearing about them. The species was a majestic grazer that played an important role in the sedge meadow ecosystem. Upon discovery of archaeological evidence and oral sources confirming that the wood bison used to roam the Alaskan flats, the United States Fish and Wildlife Service decided to begin the challenging reintroduction of the species.



Photo: Thea Foss von Ahnen

Reintroduction in a Bigger Perspective

Evidence showing that the wood bison previously inhabited Alaska inspired the ambitious reintroduction of the species to the area. The Alaska Department of Fish & Game (ADF&G, 2015) says that their goal is to return a free-ranging, disease free wood bison population to portions of their original range. The wood bison became an endangered species in 1969 through the Endangered Species Act (ESA), which requires a range of protections for listed species and their habitats (ADF&G, 2015). This makes reintroduction work harder, as people sometimes oppose the presence of an endangered species on their land due to elevated restrictions and requirements (ADF&G, 2015). However, this work is important in the context of global biodiversity loss.

Donlan (2005) describes the concept of “re-wilding,” in a global perspective. It is a bold plan for preserving some of our global heritage of megafauna. The project aims to restore some of the evolutionary and ecological potential that has been lost over the centuries (Donlan, 2005), by reintroducing locally extinct species. If this

plan is implemented successfully, it will provide useful models and examples for future projects. This article will discuss the process of wood bison reintroduction in Alaska, beginning over twenty years ago. It will briefly assess the biological, economic, and social aspects of the process. Finally, it will answer the question of whether or not the reintroduction has been a success and whether this reintroduction is replicable in other states and countries.

Evidence That the Wood Bison Belongs in Alaska

There is evidence that wood bison used to live in Alaska, but when or why they disappeared remains a mystery. However, Rogers and Stephenson (2015) found, through interviews with elderly people living in native Alaskan villages, that four old women remember seeing wood bison in their childhoods. Confirming these accounts, archaeologists have uncovered wood bison bones in multiple locations in Alaska (Rogers & Stephenson, 2015). Pathologists and other scientists are still working on document-

ing the wood bison's history in Alaska (Rogers & Stephenson, 2015). Evidence shows that the bison entered North America from Eurasia several hundred thousand years ago, crossing the Bering Land Bridge. The age of the most recent wood bison-remains found in Alaska was estimated using radiocarbon dating and found to be 170 years old (Rogers & Stephenson, 2015).

With evidence of the wood bison's recent history in Alaska, it comes as no surprise that Rogers and Stephenson (2015) state that the bison should coexist well with other Alaskan animals. This is mainly because bison are primarily grazers while moose are primarily browsers, so they will not be in competition for food. Predation is also minimal compared to that of moose and other ungulates (Rogers & Stephenson, 2015). According to Rogers and Stephenson (2015), re-establishing a native species is usually healthy for the ecosystem and enhances the ecological and wildlife diversity. With expected climate change, Rogers and Stephenson (2015) claim that the habitat may shift more towards grasslands, creating even more bison habitat in Alaska. The bison will fill an important role by grazing the grasslands, reducing shrub encroachment, recycling nutrients, and contributing to soil disturbance (Larter & Gates, 1991). Before the bison reintroduction, the grazing niche in Alaska was essentially empty (Rogers & Stephenson, 2015). Therefore, the wood bison are important to the sedge meadow ecosystem, and reintroducing them is expected to improve the recirculation of nutrients back into the soil (Larter & Gates, 1991).

Biodiversity and the Ecological Value of Wood Bison vs. Plains Bison

Known for filling the grazing niche in the contiguous 48 United States, the plains bison differs from the lesser known subspecies of wood bison in many ways. Plains bison exist in both the contiguous 48 United States and Canada (Freese et al., 2007). They look very similar to wood bison at first glance, but there are several differences (Fig. 1). The wood bison are North America's largest native land mammal and are

typically larger than the plains bison (Rogers & Stephenson, 2015). They have a different hump, colour, and cape. The wood bison's larger heads help them sweep away snow to access grasses and sedges that they rely on for food (Rogers & Stephenson, 2015). A wood bison bull can weigh 2000 lbs, and they are better adapted to the harsh conditions in the northern climate (Lattuga, 2015).

In addition to their similar appearance, the plains bison shares a similar history to the woods bison in that they also nearly went extinct. According to Freese et al. (2007), the plains bison roamed the American plains in large numbers before European settlement. Within the mid-1800s, the numbers were critically low for the species, mostly due to extensive hunting. The species was saved by interbreeding with cattle to mix the gene pool. Today there are about 500,000 plains bison, and only a few are free of the cattle gene (Freese et al., 2007). In contrast to the plains bison, the wood bison was not saved, and it went locally extinct in Alaska. If it were not for one curious biologist, they would probably still not exist in Alaska today.

Bob Stephenson: The Biologist Behind It All

The idea of reintroducing the wood bison to Alaska emerged from a biologist who discovered a certain species of grass in the Fort Yukon Area over twenty years ago. The biologist, Bob Stephenson, knew that these grasses were a type bison foraged on, and he began to wonder if there could have been bison in the area (ADF&G, 2015). He started to investigate and found, as mentioned earlier, oral confirmation and bison bones. This caused him to propose the reintroduction of wood bison as an extra source of red meat for the native communities. In addition, they would reach the conservation goal of returning free-ranging wood bison to portions of their original range (ADF&G, 2015). In the mid-1990s, researchers conducted feasibility and habitat studies. ADF&G expanded the project in the early 2000s to consider other suitable areas with bison habitat (ADF&G, 2015). Lower Innoko River, Yukon Flats, and Minto Flats

were among the areas ADF&G studied for potential release sites.

Addressing Community Concerns With the 10(j) Rule

In the meantime, the U.S. Fish and Wildlife Service (USFWS) and ADF&G worked together and acquired a 10(j) ruling that established provisions for managing wood bison as a non-essential experimental population (ADF&G, 2015). The ruling was as follows: Section 10 of the Act, entitled “Exceptions,” offers an avenue to authorize activities that would otherwise be prohibited. Under section 10(j), the Secretary of the Department of the Interior can designate reintroduced populations established outside the species’ current range, but within its historical range, as “experimental.” (USFWS, 2015)

ADF&G (2015) states that by acquiring the 10 (j) rule, it was possible to address local concerns from private and commercial interests in the potential areas for reintroduction. The wood bison was listed as an endangered species until 2012 and then downgraded to “threatened” (ADF&G, 2015). According to Innes et al. (1998), private lands hosting an endangered species are often restricted from certain types of use that could harm the species or its habitat. This can include restrictions on development, logging, water use, and so on. Illegal hunting is a common problem that can be avoided by including locals and giving them a feeling of ownership (Mannigel, 2008). Keeping open dialogue with local communities and not prohibiting hunting once the bison population is established makes success more likely (Rogers & Stephenson, 2015). Mannigel (2008) says that increased personal contact and trust is important to raise local acceptance of protected areas and promote partnerships for conservation and development. According to Rogers and Stephenson (2015), economic growth is one of the additional positive outcomes from the reintroduction. Increased wildlife viewing will benefit the tourist industry, and it will lead to enhanced and diverse hunting opportunities for native and local communities.

Alaska Wildlife Conservation Centre: Breeding Aggressive Wood Bison

According to Mike Miller, founder of the Alaska Wildlife Conservation Center (AWCC), the restoration project got an unexpected kick-start in 2003 when a private person imported a herd of 13 wood bison from Canada without the legal permits. The owner had to surrender the herd to ADF&G, who put them in the care of AWCC (Miller, 2015). The plan was initially to keep the bison in quarantine at AWCC for a few years. However, permits and other obstacles took more time than expected. The wood bison ended up staying for about 10 years before their eventual release into the wild (Miller, 2015).

Breeding at the AWCC was based on the physical characteristics of the bulls and their behaviour towards humans. Conservationists chose big bulls with the best wood bison features and bulls that behaved most like undomesticated bulls. They also bred the most aggressive bulls because they did not want to breed bison that were interested in and unafraid of humans. The hope was that these bison will avoid human contact after the release (Miller, 2015).

The US also had the advantage of learning from Canada, which has been restoring bison for over 20 years. Miller (2015) learned of several mistakes made in Canada and warned the US about potential pitfalls. For instance, Canada had to kill 875 bison because they had bred on a bull with TB (Tubercle Bacillus). Therefore, the bison project in Alaska was closely monitored by veterinarians for diseases, and the breeding was watched closely (Miller, 2015).

In addition to the challenges of breeding healthy and genetically diverse wood bison, the AWCC also had to plan the actual release in the Lower Innoko/Yukon River areas (ADF&G, 2015). Efforts to prevent hunting in the early stages of the release were crucial. The strategy used was to give people ownership of the wood bison, and it has so far shown good results. The natives will be allowed to hunt a small number of bulls now and hopefully more in the future (Rogers & Stephenson, 2015).

The Arduous Release

With the locals on board, the release of the wood bison could begin. Alaska is wild, rural, and remote. To relocate the bison herd, it was necessary to fly the bison from Anchorage to Shageluk. This was scheduled late winter/early spring, so the females could calve after the relocation (ADF&G, 2015). Bison are likely to return to places they like for breeding, meaning the females would hopefully continue to breed in Shageluk in coming years. (Miller, 2015). The transportation was a joint effort with many different companies, people, and communities collaborating and contributing funding. In early April, one hundred wood bison were released (Miller, 2015). Seventy-five were cows, twenty-five of which were pregnant, and the rest were juvenile bulls. In late May an additional twelve mature bulls were released (Miller, 2015). The bison were flown in closed containers, and many have radio collars to gather data and track their movements. This will help scientists understand how well the herd is adapting to their new surroundings (ADF&G, 2015).

Media Coverage and Donations

The strenuous release and excitement of free-ranging wood-bison drew media from several states. Media coverage is positive for Alaska, as it encourages people from the contiguous 48 United States to visit, since Alaskan wildlife is a huge draw for tourists. Media coverage also makes it easier to get sponsors and grants to support the future of the wood bison (Miller, 2015). Donations from several companies and private persons, combined with the media coverage, led to an influx of funds and sponsors that made this very expensive project possible. This has allowed Miller (2015) to claim that wood bison reintroduction is the biggest wildlife conservation project in North America.

The Road Ahead

Alaska Wood Bison Management Planning Team's vision statement states that through the collaboration of many, they will be able to reintroduce and manage a sustainable wood bison herd, while ensuring a healthy landscape that benefits future generations (ADF&G, 2015). Coggins (2015) reports that on June 16th, wood

bison were observed in Kuskokwim and in the Holy Cross area. Biologists say this is good news for the reintroduction. The more the bison learn the expanse of their habitat and its resources, the better prepared they will be to survive the winter with its limited food sources (Coggins, 2015). It is desirable that they expand their habitat as much as possible, especially since they have nearly unlimited space available to them. Coggins (2015) writes that the bison released near Shageluk have been foraging on grasses and obtaining a lot of energy to go exploring over long distances. This year, biologists estimate that more than twelve calves have been born in the wild. The herds will most likely meet together again in late July and August for the breeding season (Coggins, 2015).

With these reports, the reintroduction of wood bison in Alaska certainly looks promising. However, its true success will be measured in how many calves are born, not this year, but in following years (ADF&G, 2015). If they continue to breed and survive the cold, harsh winters, the reintroduction can be considered a success. That being said, other important factors like diseases, illegal hunting, winter temperatures, and snow depth also pose threats to the success of the reintroduction (Coggins, 2015).

Is Alaska Unique Regarding the Success of Reintroduction?

Would reintroduction be as successful in Europe or the contiguous 48 United states? The wood bison are big animals and require a significant amount of space and habitat (Larter & Gates, 1991). Alaska is uniquely suited to the presence of wood bison under modern conditions. The state has a population density of 1,20 people per square mile, as compared to the next most sparsely populated state, Wyoming, with 5,49 people per square mile (Worldatlas.com, 2012). Alaska has more or less unlimited space and habitat for the wood bison. The Alaskans are also used to living and co-existing with numerous large mammals. Both bears and moose are abundant in rural and urban places such as Anchorage (Sherwonit, 2008). With the 10(j) rule, the landowners are also satisfied and more cooperative, knowing their land will not be put under strict regulations that prevent them from

exploiting their natural resources. With plenty of prime habitat and inhabitants accustomed to and accepting of large and sometimes aggressive mammals, everything is set up for success.

If this reintroduction happened in Europe or the contiguous 48 United States, the habitat would be smaller, posing a threat to the perceived safety of neighbouring people. In most states and countries, people are not accustomed to having big, potentially dangerous animals in close proximity. The necessary sedge habitat might also be unavailable if it is being used for agricultural purposes. Wood bison activity in agricultural areas can cause damage to fences or crop damage from trampling and foraging (ADF&G, USFWS, 2013). If the habitat is too small or too close to agricultural areas, this will most likely lead to conflicts and resistance from the local population.

Because Alaska has such unique size, population density, and culture, the reintroduction might not be transferable to other states and countries.

Conclusion

The reintroduction of wood bison in Alaska has been successful so far, serving as a positive example for future reintroduction projects. The goal of any conservation project of this nature should be to carry out equally thorough research and engage communities like the AWCC and ADF&G have. However, due to the unique habitat requirements of the wood bison, transferring this method of reintroduction to other locations will most likely not be a success unless the target country or state has a vast amount of available wilderness.

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SUCCESS?

Norway's Electric Vehicle Market— a Success-Story?

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In recent years, the electric vehicle market in Norway has quickly grown. This paper examines the EU's role in regulating Norway's electric vehicle market. First, it will detail Norway's adoption of the Kyoto Protocol and how the Climate Policy 2012 further targeted the CO₂ reduction requirements. Next, it will discuss Norway's goals and targets for reducing CO₂, followed by a closer look at the drivers behind the regulations and the different environmental policies. The paper will also critically examine the selected policies and investigate how they could negatively affect stakeholders. It will describe why the electric vehicle market in Norway is an interesting subject and investigate why Norwegians invest in electric vehicles. Lastly, it will discuss the repercussions that would follow if the government decides to drop the incentives.

Climate Change Policies in Norway

The idea to incentivise purchasing electric vehicles, including battery electric vehicles and plug-in hybrid electric vehicles, has its roots in the Kyoto Protocol. Norway adopted the Kyoto Protocol in 1997, which is a legally binding agreement that targets the reduction of Green House Gases (GHG) as well as Carbon Dioxide (CO₂)

emissions. In order to meet these targets, Norway's government implemented "various policy instruments and measures, including environmental taxes, direct regulation and agreements" (Miljøverndepartementet, 2005, p. 6). These policy instruments have been gradually enhanced and developed further. Norway gave its consent to the Framework Convention on Climate Change (UNFCCC) in 1993, signed the Kyoto Protocol agreement, a symbolic gesture, in 2002, and ratified the Kyoto Protocol agreement in 2005 (Miljøverndepartementet, 2005). The ratification of the Kyoto Protocol carries legal obligations and effectively becomes a contractual agreement (Bloch, n.d.).

As Sandes and Astrup (2012) state, within the first commitment period of the Kyoto Protocol, Norway decided to reduce their CO₂ emissions by 10 percent. Moreover, they targeted to reduce greenhouse gases by 30 percent compared to the 1990 level and aimed to become carbon neutral by 2050. In order to meet these goals, the Norwegian government targeted specific sectors, for instance the transport-sector. Some of the goals within this sector include establishing low emission zones, increasing investment in community public transport and other

climate friendly transport-forms to urge communities to implement a parking-policy (Sandes & Astrup, 2012).

In the 2012 climate policy settlement, the Norwegian parliament made the decision to target an average of 85g/km CO₂ emission for personal vehicles. This target can be reached “if either EVs [Electric Vehicles] or PHEVs [plug in hybrid electric vehicles] or both types of vehicles achieve significant market shares, in parallel with substantial emission reductions from conventional vehicles” (Figenbaum & Kolbenstvedt, 2013, p. 8). If either the EV or PHEV fail in the market, EV’s market share will have to reach at least 20 percent of the total vehicle-market, and PHEV’s market share will have to reach 30 percent in the total market, to reach the goal of 85 g/km CO₂ emission. As Figenbaum and Kolbenstvedt (2013) point out:

The main measure to reach the 85 g/km target will be to increase the CO₂-part of the registration tax, making high emitters more expensive. At the same times this makes EVs and PHEVs more competitive against higher emitting conventional vehicle. (p. 8)

As the competitiveness of EVs and PHEVs rises due to a larger selection of low emission vehicles available on the market, the initial tax increase will slowly phase out over time (Figenbaum & Kolbenstvedt, 2013).

Punishment and Crime Within the Kyoto Protocol

Hovi and Kallbekken (2004) discuss the effects of non-complying countries and their consequences on Norway’s welfare state. Consequences for non-complying countries include:

...(i) deduction from the party’s allowance for the second commitment period of 1.3 times the amount of excess emissions in the first period, (ii) development of a compliance action plan, and (iii) suspension of the eligibility to sell permits under the emissions trading provisions until that right is reinstated. (Hovi & Kallbekken, 2004, p. 1)

Scholars often discuss the enforceability of the Kyoto Protocol. Hovi and Kallbekken (2004) point out that the follow-up of the Kyoto Protocol, the Marrakesh Accords, include a Facilitative Branch that is supposed to help with the implementations of the regulations.

The Marrakesh Accords also include an Enforcement Branch that determines “whether a party is in non-compliance with its emission target, its reporting requirements, and the eligibility requirements” (Hovi & Kallbekken, 2004, p. 1). Hovi and Kallbekken (2004) highlight several flaws with the Marrakesh Accords. For instance, if a country “in the first commitment period fails to comply in the second period as well, then it must presumably make up for the difference (plus 30 percent) in the third period” (p. 1). This indefinite delays punishment, giving little incentive to countries to comply. Hovi and Kallbekken (2004) stress that if countries anticipate punishment, they are more likely to implement a higher allowance in the next negotiations for the second period of emission targets, which would reduce the odds of punishment. Another point made by Hovi and Kallbekken (2004) is that “any party is entitled to withdraw from the Kyoto Protocol giving 12 months’ notice. It follows that a country that is being punished might evade the punishment simply by withdrawing from the Kyoto Protocol” (p. 1). However, one of the most significant arguments regarding the Enforcement Branch of the Marrakesh Accords is that “the compliance mechanism is not legally binding, and can be made so only through an amendment which requires a three-fourths majority vote of the Meeting of the Parties” (Hovi & Kallbekken, 2004, p. 1). Even if an amendment receives an affirmative vote, “the compliance mechanism becomes binding only on those countries that choose to ratify the amendment” (Hovi & Kallbekken, 2004, p. 1).

Norway’s Suffering Welfare State

In this section, the paper will discuss how the above-mentioned shortcomings of the Marrakesh Accords affect Norway. Norway is a major exporter of fossil fuels and thus a buyer of emission permits. In a hypothetical scenario, Hovi and Kallbekken (2004) point out, that if a “large seller of emissions permits, such as Rus-

sia, faces punitive consequences, other sellers benefit from a higher permit price. By contrast, buyers, such as Norway, suffer significantly" (p. 2), because "the external costs following from the imposition of punitive consequences will be borne by buyers of emissions permits" (Hovi & Kallbekken, 2004, p. 2). A punished country's allowance to buy permits will be reduced, which "means that the combined emission target for the countries trading in the international market for emission permits becomes more stringent. This boosts the demand for permits" (Hovi & Kallbekken, 2004, p. 3). However, this punishment also increases the permit price. The punishment includes the suspension of selling the permits of the punished country, which will result in fewer permits available to buy on the international market. In turn, this will increase the price of the permits (Hovi & Kallbekken, 2004).

The increased permit prices result in higher emission target costs for all permit buying countries. "This cost increase will be particularly high for a permit buying country that is punished, as the country then also has to buy additional permits" (Hovi & Kallbekken, 2004, p. 3). In turn, a permit selling country would receive higher revenue in the international permit markets. In contrast, a punished permit seller's welfare loss would be disproportionally large, as they lose all the sales revenue. These economic effects can be difficult to predict and may have devastating consequences, "especially if the domestic price for emission permits drops below the international price" (Hovi & Kallbekken, 2004, p. 3). The decrease in the domestic emission permit price would lead to an increase in the fossil fuel demand, but "at the same time, however, the demand for fossil fuels decreases [for] the rest of the world" (Hovi & Kallbekken, 2004, p. 4).

Hovi and Kallbekken (2004) experiment with five Annex 1 countries (Norway, Japan, Russia, Canada and Hungary) and conclude in their study that Norway would be punished if other countries do not comply with the Kyoto Protocol. Annex 1 countries refer to industrialized countries that were members of the OECD in 1992, plus countries with economies in transition (the EIT Parties) (UNFCCC, 2014). This also includes the Russian Federation, several

Central and Eastern European States as well as the Baltic States (UNFCCC, 2014). If Norway does not comply, the welfare loss would be 0,006 percent, whereas if Japan were punished, Norway would have a welfare loss of 0.013 percent. In another comparison:

...if Russia is punished, Norway must endure a massive loss of 0,812 percent... the cost to Norway of meeting its Kyoto commitment increases by USD 5 million if Norway is punished itself, and USD 525 million if Russia is punished. (Hovi & Kallbekken, 2004, p. 8)

Since Norway is a big exporter of petroleum, it might face similar difficulties with the EU Emissions Trading Scheme (ETS) if countries do not comply with the set targets. The EU ETS is a prevalent climate policy tool designed to prevent carbon leakage. This scheme is supposed to incentivise companies to avoid offshoring their production, as they will receive financial benefits from staying within Norway. The ETS is the EU's only policy tool and works by buying and selling emission permits within the EU, quite similar to the Kyoto Protocol (Regjeringen, n.d.).

Norway's EV Market put Into Perspective

Hannisdahl, Malvik and Wensaas (2013) point out that the sales of EVs in Norway are comparable to countries like Germany, France and the UK. EV Norway (n.d.) believes Norway's success is the results of the incentives put in place for Zero Emission Vehicles. EV Norway (n.d.) also believes that the incentives are the main reason Norway has the world's highest number of electric cars per capita by a wide margin. EV Norway (n.d.) stresses that the Norwegian government has not created a political strategy to achieve this goal, but rather that the success is the result of many small measures adopted over the years to support a growing Norwegian EV industry and to reduce emissions from road transportation.

Most electric passenger cars were registered in the Akershus region, with about 8000 registered electric vehicles in 2013, and the Oslo region, with a close second, with about 7000

registered vehicles (Statistics Norway, 2015). This comes as no surprise, as Coe et al. (2004) explain, “the state and its development agencies are institutions that are strongly embedded locally in specific regions” (2004, p. 472), meaning that the incentives might have been especially created for the commuters living in the Akershus region.

Many commuters working in Oslo live in Akershus and therefore benefit greatly from the exemption of having to pay tolls when commuting between Oslo and Akershus as well as the free parking and using the bus lanes during rush hours. Not only do these commuters save time, they also save money. Chairman Bu of Norway’s Electric Vehicle Association believes that the main reason Norwegians purchase EVs has nothing to do with the Norwegian psyche or love of the environment, it came when people started to realise there were huge savings to be made (Merill, 2014). Merill (2014) also indicates the possibility, that although the original incentive was to reduce the greenhouse gas emissions, this might not be the most important concern for the consumers.

Not Everything Environmentally Friendly is Green

Focusing on the vehicle market, Dicken (2015, p. 488) argues that the state is “heavily involved through environmental and vehicle safety policies, each of which has profound implications for the design, technology and materials used in cars and, therefore, in their cost.” Dicken (2015) further explains that when governments decide to change legislation it can often be difficult for manufacturers to follow. Technology can act as a great enabler for governments to achieve their specific targets. As Dicken (2015) points out, technology makes it possible to invent “new structures, new organisational and geographical arrangements of economic activities, new products and new processes, while not making particular outcomes inevitable” (p. 75). However, it is important to consider that although using electric vehicles can minimise CO₂ emissions, this depends on where the electricity used to recharge the electric vehicles originally stems from. Electricity in Norway comes from renewable energy sources, which help “to reduce emis-





sions of greenhouse gases" (Miljøverndepartementet, 2005, p. 22). This might not be the case in other countries.

The unstable supply of lithium for the electric vehicle batteries has also to be taken into consideration. Waste Management World (n.d.) points out that most of the global lithium deposits are found in South America, this poses a risk because of the "unrest or instability of the governments in these regions can greatly affect the supply and impact the battery price, and in turn, the vehicle cost" (para. 2). As for now, inter-governmental partnerships are being established which are researching a way to recycle batteries once they have "completed their life-cycle" (Waste Management World, n.d., para. 7). Waste Management World (n.d.) also points out that recycling lithium makes no economic sense because it is more expensive to recycle the lithium although we have the means to do so. "However, with increasing number of EVs entering the market in the future and with a significant supply crunch, recycling is expected to be an important factor for consideration in effective material supply for battery production" (Waste Management World, n.d., para. 8).

Norway's Electric Vehicle Market Facing Policy Changes in 2017

The Norwegian government has said that once the target of 50.000 electric vehicles is reached in the Norwegian electric vehicle market, the government would stop the incentives. If the target is not met, the government would reconsider the incentives in 2017. Solvik-Olsen, Norway's Minister of Transport and Communication, confirms:

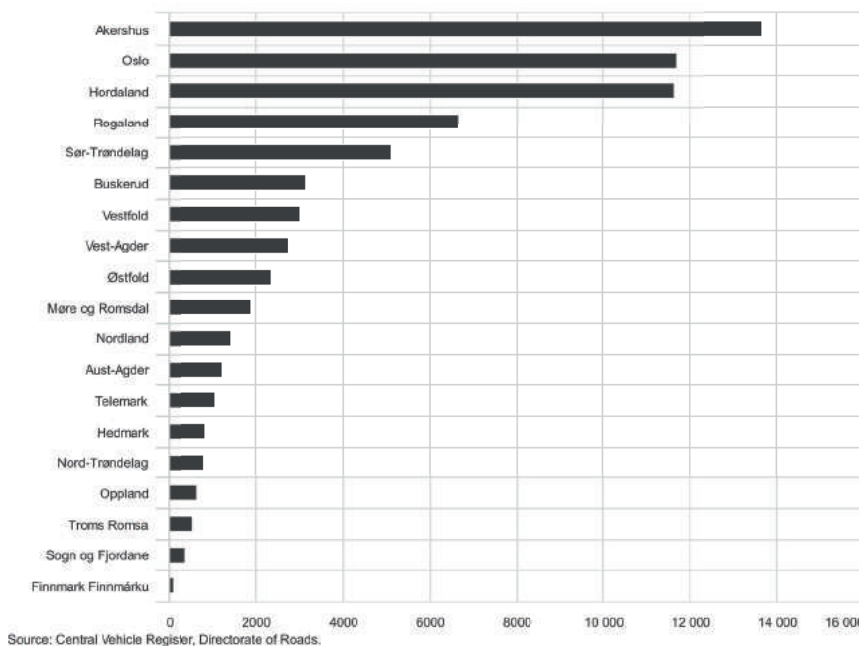
When it comes to electric-car policy, the climate agreement is very clear. The benefits that apply now, are going to last until we reached the goal of 50.000 electric cars on the roads. We will be reaching this goal soon. [translated from Norwegian] (NTB, 2015, para. 9)

Solvik-Olsen also points out, that stopping all incentives seems radical and that the government should rather discuss which incentives work in favour of a greener government and which incentives do not (NTB, 2015).

Additionally, the electric vehicles in the bus lanes can be counterproductive (Deshayes, 2014). Commuters relying on public transportation as well as employees of the public transportation systems have shown irritation and aggravation concerning electric vehicles using the bus lanes, leading to road congestion. The incentive from the government to make public transportation more attractive to commuters, rather than using their private cars, will work against itself, as many commuters experience that electric vehicles have more benefits than the public transportation system. The market and especially the consumers have started to view the changes critically. As Deshayes (2014) points out, bus drivers are getting more irritated with clogged bus lanes and they fear that users of collective transport will purchase electric cars instead of ride the bus. Solvik-Olsen stresses, "We get many complaints from public transport users who say that the density of electric vehicles in certain areas has become a problem. This is now becoming a problem for public transportation" [translated from Norwegian] (NTB, 2015, para. 14). This can be seen as an indication that the bus lane driving might be soon a part of policy history.

Conclusion

The case of the EV market in Norway can be seen as a successful model for other personal automobile markets. However, some of the implemented incentives seem to be misdirected and only target monetary value rather than environmental conflicts. Although Norway is bound to reach 50.000 electric vehicles within 2015 [goal reached], it is important to remember that electric vehicles still represent a small percentage of the overall vehicle market regionally and even more so, globally. To achieve long-term global climate results a government that wants to support the electric vehicle market would have to work more globally. Pushing the electric vehicle market could be a step in the right direction when it comes to mitigating climate change.

Figure 1. Stock of electric passenger cars by county. 2015

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Letter

The Racial Component of Ecological Landscape Architecture in Nazi-Germany

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Ecological landscape design is often framed as a holistic approach to landscape design. However, evidence shows that ecological landscape design has not always been supported for positive reasons. Nazi Germany also supported ecological design—because of their racial ideology. This essay will explain Germany's impact on garden theory, especially between the years 1933 and 1945.

During the development of more “natural” gardens in the 19th and early 20th centuries, nature conservation and protection movements came into existence, with Germany playing an important role. Unfortunately, these movements often went hand-in-hand with so-called “Heimatschutz” movements. The term “Heimat”—roughly translated as “homeland”—has negative, racial connotations (Wolschke-Bulmahn, 1996). It was, and still is, heavily used by different nationalist and racist groups (Jacobsen, 2009). Garden historians can link natural garden designs with proper ecological behaviour, conferring moral authority to terms like “ecology” and “nature.” But when doing this, they are often unaware of the “ideological minefields they tread” (Wolschke-Bulmahn, 1999, p. 162). They do not consider renowned garden designers who

were active between 1933 and 1945. Some had links to the National Socialist German Workers' Party (NSDAP).

The German garden designer Willy Lange was an early supporter of the ideology of the NSDAP. The racial component of this ideology inspired his ecological approach to his landscape design. Whereby, he advocated for native plants in their natural setting (Beitmann, 2009). Lange and his followers assumed that the German people had a “genetically based relationship to nature and were closely bound to particular landscapes” (Wolschke-Bulmahn, 1999, p. 164). Natural gardens and landscape design was therefore seen as a fundamental prerequisite for preserving the “racial, and thus the cultural, strength of the German people.” (Wolschke-Bulmahn, 1999, p. 164). According to Lange, the nature garden (Naturgarten) was the next stage in gardening and Germany was entitled to give this style its name and be a “refiner of the world” (Beitmann, 2009, p. 570).

With the rise of National Socialism, Lange became increasingly radical in his racial interpretation of the history of gardens. He rejected the “formal” gardens of France as a “garden expression of the south-alpine Mediterra-

nean race” while “the English style germinates from the reawakened feeling for one’s race of the north-alpine, the Nordic people” (as cited in Wolschke-Bulmahn, 1999, p. 165). Lange’s approach to ecology politicised a seemingly innocent method of landscape design. He was not the only German who contributed his ideas to ecological design during this period.

Another, arguably even clearer, example is the garden historian Franz Hallbaum, who linked the landscape garden to the “blood and soil” ideology, explaining the creation of the landscape garden with a race-specific connection to nature: He accredited the Nordic race with a unique primal connection to nature, as opposed to other races that subjugated nature. (Wolschke-Bulmahn, 1999).

The racial garden philosophy which Lange and Hallbaum advocated was used to justify persecution when German landscape architecture strategies became closely connected to National Socialist ideology and politics. For example, the expulsion of the Polish population after the annexation of the Polish territories in 1939 was based on what the Nazis claimed to be ecological principles. The ideal German people were seen as living in harmony with their natural environment (Wolschke-Bulmahn, 1999). Landscape architects, regional planners and architects under the leadership of Heinrich Himmler, Reichsleader of the SS were trying to place Germans in Polish territory—in their “biological healthy living space” (Mäding, 1942 as cited in Wolschke-Bulmahn, 1999, p. 168) This was effectively a measure to use landscape architecture as a means to establish a German identity and suppress a Polish one.

However, when the rule of National

Socialism ended, many gardeners and garden historians that had previously been strict ideologists adjusted their versions of garden history. For instance, Heinrich-Friedrich Wiepking-Jürgensmann, a landscape planner under the aegis of the SS, eventually credited English garden design for starting the “garden revolution” of landscape gardens in 1966. He previously denied this, since it was not in line with the party’s ideology (Wolschke-Bulmahn, 1999, p. 170). This further indicates that some German contribution to ecological landscape architecture was ideologically based.

Despite this evidence, garden historians in the 1980s and 1990s have tried to separate ecology and politics, trying to prove the “ecological goodness” of landscape designers during the Third Reich (Wolschke-Bulmahn, 1999, p. 171). Surprisingly, even the role of leading Nazis like Alwin Seifert, landscape architect and strict ideologist, was downplayed, when his work was praised by William Rollins, who called his highway project a “platform for systematic ecological reform” (as cited in Wolschke-Bulmahn, 1999, p. 172). Rollins, as well as other historians arguing in the same vein, blatantly ignored Seifert’s underlying racial motivations that were intertwined with his landscape management policy.

This paper shows that some of the German development of ecological landscape design was based on racial ideology and this has been partly ignored by historians. Needless to say, arguing that all advocates for ecological landscape planning should be labelled as “Nazis” would be an overgeneralisation. However, the alleged “goodness” of concepts such as ecological design should not be blindly accepted.



Photo: Torunn Brånå

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Cour
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The International Criminal Court: Symbol of Justice or Defunct Fantasy?

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The International Criminal Court (ICC) is an arena where any individual, anywhere in the world, can be tried for criminal charges. Designed to function independently, the ICC challenges state sovereignty to uphold an international rule of law against criminals. Such an institution seems unlikely to succeed in a world dominated by complex and politicised power relationships. Yet the ICC exists, with an objective to hold those who have committed war crimes accountable for their actions. Jessberger and Geneuss (2012) state that “[international criminal justice]... makes the ICC a revolutionary project: An international institution applying international law which, however, directly addresses the individual human being” (p. 1085). The ICC is a truly innovative institution with a profound objective.

For the ICC, the transfer from ideals to reality has proven difficult because not all states favourably view the ability to try *any* individual with criminal charges. When the concept of the ICC began to build momentum, many states opposed its establishment. This comes as no surprise, especially when advocates for the ICC continually “insisted that the new court must be independent, impartial, and fundamentally apolitical” (Bosco, 2014, p. 3). In actuality, the ICC has only partial membership from states worldwide. Since its establishment in 2002, opinions regarding the ICC’s success and worth are divided (Jessberger & Geneuss, 2012). To understand its impact on world justice, this paper explores and discusses how the International Criminal Court has both succeeded and failed in upholding an international rule of law against individuals suspected of war crimes.

Background of the ICC

The idea for the ICC originated at the Nuremberg and Tokyo trials in the aftermath of World War II. Following the Axis defeat, the Allies established criminal tribunals to punish individuals responsible for war crimes. The Allies decided to put individuals on trial rather than executing Axis leaders after they were captured and identified (Bosco, 2014). However, once established, these first criminal tribunals were structurally biased: The prosecutors of the defeated Germans and Japanese consisted entirely of judges from winning powers. The Allies apprehended criminals suspected of mass atrocities, but they never considered putting members from their own side on trial for partaking in similar

acts (Bosco, 2014). Later, this power imbalance would re-emerge among the same nations leading the trials. The World War II war tribunals undoubtedly paved the way for the ICC and laid the foundation for putting criminals suspected of war crimes on trial.

When Holocaust-like images surfaced during former Yugoslavia's break-up, the concept of the ICC developed and gained momentum. As reports of widespread violence leaked from conflict zones, communities and activists around the world put pressure on their respective states to take action (Bosco, 2014). Strain on the United Nations Security Council (UNSC) intensified, and the United States suggested trying war criminals. Other members of the Security Council eventually approved the idea on the basis that trials cost less than, and would also avoid, direct troop deployment (Bosco, 2014). While decision-making about trials in the former Yugoslavia continued, genocide erupted in Rwanda. The UNSC decided to establish *ad hoc* tribunals for both conflicts, but logistical problems continually emerged at each. High costs and difficulties apprehending suspects made creating *ad hoc* tribunals a particularly troublesome task. The long-standing movement to create a permanent international court therefore evolved to pave the way for the drafting of the Rome Statute (Karns et al., 2015). This statute would later become the treaty that established the ICC.

Smaller and less dominant states drafted the Statute because "they thought of themselves as more able to construct international architecture that would be perceived as fair and legitimate by the rest of the world" (Bosco, 2014, p. 39). Bosco (2014) claims the draftees did not want powerful UNSC member states – which approached the project with suspicion – to undermine impartiality in international justice. However, when small states put concerted pressure on large states to cooperate, an assembly of state parties convened in Italy to adopt the Rome Statute in 1998 (Bosco, 2014). Crimes could only be reviewed after the Statute's entry into force, leaving all crimes committed before-

hand outside of ICC jurisdiction. After meeting the assembly's requirement of sixty ratifying states, the Rome Statute went into force on July 1st, 2002 (Akhavan, 2005; Bosco, 2014).

Configuration of the ICC Within the International Arena

The Rome Statute dictates the jurisdiction of the ICC. Explicitly, this jurisdiction is "limited to the most serious crimes of concern to the international community as a whole" (Rome Statute, 1998, p. 3). Furthermore, individuals must *willingly* and *knowingly* carry out serious crimes to fall under the ICC's jurisdiction (Rome Statute, 1998). Serious crimes encompass four areas: "the crime of genocide, crimes against humanity, war crimes, and the crime of aggression" (Rome Statute, 1998, p. 3). For each category, sub-items delineate the ICC's jurisdiction in detail. Specifically, these statements include torture, sexual slavery, forced pregnancy, forcible transfer of populations, attacking towns and villages by any means, and attacking civilian populations, among others (Rome Statute, 1998). Upon ratifying the Rome Statute, member states must cooperate fully with the ICC to investigate, pursue, and apprehend convicted individuals (Rome Statute, 1998). Arsanjani and Reisman (2005) suggest that the Statute is extremely detailed and comprehensive to minimise any possible misinterpretations or confusion about a trial.

The main principle underlying the ICC is the notion of impartiality and judiciary independence from state powers. The idea of independence was critical to holding all individuals committing war crimes, within all states, equally accountable for their actions. Bosco (2014) explains that "the story of the [ICC] is in many ways the story of [a] simple aspiration: that those guilty of serious crimes, even those individuals who command armies or occupy high office, should be held accountable" (p. 1). State parties drafting the Rome Statute strove for this ideal. The ICC looks to separate itself, therefore, from powerful state parties that may otherwise look to influence the ICC's operations.

The ICC essentially functions like a state court, although its scope and jurisdiction are revolutionary. Fundamentally, the ICC is *a court of last resort* because it investigates crimes only when national courts are unable or unwilling to deal with them (Bosco, 2014; Karns et al., 2015). These situations occur, for example, after a state's judiciary structure has collapsed due to civil war, when resources are unavailable to prosecute individuals, or when an individual abuses a high position in government. National courts must still prosecute convicted individuals by all means necessary under their own jurisdiction (Akhavan, 2005). However, if a state and the ICC disagree whether a national hearing was legitimate or not, the ICC will review the case and can ultimately decide on a re-trial if it believes there were legal discrepancies at the national level (Bosco 2014).

Successes of the ICC

Establishing the ICC represents a concerted commitment by member states toward ensuring that justice is pursued in an open, cooperative, and fair system. Akhavan (2013) asserts that “the fact that there are functioning international criminal tribunals that we can critique is itself a phenomenon that was unthinkable 10 to 20 years ago” (p. 529). The fact that a group of sovereign states ratified an agreement to give an independent court jurisdiction over their military commanders and top politicians is remarkable. The ICC demonstrates a willingness for a just and greater world order.

Another groundbreaking aspect of the ICC is its emphasis on women's rights. Throughout the Rome Statute, references concerning crimes against women continually emerge. In the *crimes against humanity* section, several crimes are listed: “rape, sexual slavery, enforced prostitution, forced pregnancy, enforced sterilisation, or any other form of sexual violence of comparable gravity” (Rome Statute, 1998, p. 4). Stretching back centuries, conflicts around the world have featured horrendous acts committed against women. Bosco (2014) asserts that the

Rome Statute broke new ground by classifying violence against women as a war crime and explicitly criminalising forced pregnancy. By specifically targeting individuals who have committed crimes against women, the Rome Statute is a paramount success.

Building on these successes, a case study of conflict in Uganda illustrates how the ICC successfully targets war criminals. During a conflict with a guerrilla group, ICC involvement triggered unprecedented repercussions for the securitisation of the country.

A Successful Case: Uganda and the Lord's Resistance Army

The Lord's Resistance Army (LRA), a rebel group formed to fight the Ugandan government, began violently attacking the Acholi people of northern Uganda in 1986 (Akhavan, 2005). The group does not have any grounded ideology, political agenda, or popular support, but it consistently committed atrocities on the Acholi population for almost twenty years (Akhavan, 2005). All attacks were systematically carried out against civilian populations. The acts committed by the LRA consisted of “murder, enslavement, imprisonment, torture, and rape...[including] forced recruitment of child soldiers” (Akhavan, 2005, p. 404). The group recruited 85 percent of its soldiers by forcibly inscribing children, who were often made to attack the same villages from which they were abducted (Akhavan, 2005). For years, the LRA received considerable support, and sanctuary, from the government of Sudan. This sanctuary enabled the LRA to partake in short-burst, guerrilla attacks in Uganda, allowing the group to retreat back across the border into neighbouring Sudan.

These guerilla attacks continued, with no international inclination to suppress the LRA or to support Uganda in defeating the rebels. Therefore, Uganda had to confront the rebels independently, but it was unable to pursue them across the border into Sudan. These tactics effectively created an arduous situation without a clear resolution.

All of the LRA's crimes fell under ICC jurisdiction. Uganda referred their case to the ICC on December 16, 2003 and became the first state to do so after the Statute's entry into force (Akhavan, 2005). Interestingly, Uganda's courts were fully functional and otherwise able and willing to prosecute members of the LRA. But because neighbouring Sudan harboured the LRA leadership, Ugandan forces could not feasibly go into international territory, take individuals into custody, and put them on trial (Akhavan, 2005). The move to refer the situation to the ICC was quite strategic, thrusting the issue into the forefront of the international consciousness.

The repercussions from the referral were monumental for the country. When the ICC was involved in the situation, Sudan was liable to comply with the ICC's investigation because it was a signatory member of the Rome Statute. The consequences of naming and shaming, as Jessberger and Geneuss (2012) argue, further jeopardise a state's reputation in the international community if it chooses not to comply with ICC investigations. Therefore, Sudan responded by significantly reducing the supply of arms to the LRA and separating themselves from the internationally condemned group (Akhavan, 2005). The biggest achievement, however, was an agreement between Uganda and Sudan that allowed Uganda's troops to cross into Sudan to attack LRA camps. Akhavan (2005) attributes the achievement to the international community's ability to persuade Sudan in ending its support for the LRA. Once the ICC became involved it had larger, sweeping effects between the state relations of Uganda and Sudan.

The ICC referral also significantly weakened the LRA. Although some members of the LRA leadership have not been captured, they face serious manhunts, stifling the freedom they once enjoyed in Sudan and ending rampant violence in Uganda. These results fall precisely into an ICC goal of indirectly contributing to ending impunity while suppressing international crimes (Jessberger & Geneuss, 2012). Another consequence of the ICC's involvement in

Uganda was a changed political landscape in the region. Just four months after Uganda referred its case, neighbouring Democratic Republic of the Congo also referred a case to the ICC, thus showing that the ICC's mandate can apply in other countries facing the hardships of domestic conflict.

The case in Uganda demonstrates that when the ICC launches an investigation, its legal actions have significant consequences for international criminals. Jessberger and Geneuss (2012) suggest the international referrals can have a larger symbolic effect. By bringing together two state parties to resolve a trans-boundary conflict, the ICC was successful in fulfilling its objectives in Uganda. However, as successful as the ICC may seem, fundamental flaws have hampered its effectiveness in other regions and situations.

Failures of the ICC

Although the ICC's mandate intends to ensure worldwide justice, some African states feel that the ICC is biased towards prosecuting individuals in Africa, where all ICC investigations to date have taken place. Many African states have deliberated about removing themselves from the ICC mandate (Karns et al., 2015). Although none of these states has yet withdrawn from the Rome Statute, the idea persists. Further frustrating African states, the ICC ignored pleas to suspend an investigation during national elections in Kenya in order to promote peace throughout the period. Displeasure throughout the continent has led to some African states noticeably distancing themselves from the ICC (Knottnerus, 2014).

Further, the ICC cannot preside over all nations' affairs because not every state ratified the Rome Statute. More states in the world are ICC members than not: 121 are member states, while 72 are non-members (Bosco, 2014). More notable, however, is the fact that only 33 percent of the world's population inhabits member state territories (Bosco, 2014). Most strikingly, only 27 percent of the global armed forces are part of

member state militaries; in other words, the ICC cannot prosecute the 73 percent of individuals who are enlisted in the armies of non-member states (Bosco, 2014). As an institution designed to uphold an international rule of law, such disproportionate figures represent a fundamental drawback to ICC operations.

States such as India, China, the United States, and Russia are not members of the ICC. These superpowers are unwilling to join the ICC because they would have no special influence over its decision-making (Bosco, 2014). The ICC challenges state sovereignty, which makes powerful states reluctant to become members. The United States' status as a non-member is particularly important, and the case below highlights why a major world superpower would be hesitant to join such a treaty.

A Case on Failure: The United States as a Non-Member State

The US resisted the ICC's creation from the beginning. Even though some prominent politicians in the US were opposed to the idea, the Clinton administration pursued ICC membership and the US signed the Rome Statute. When President George W. Bush took office, however, the US detached itself completely from the ICC and nullified the Rome Statute. A slew of provisions to detach, and protect, the US from ICC jurisdiction followed.

After recognising an ICC investigation could have grave consequences for American political goals, the US invested much effort to exclude its politicians and military from ICC jurisdiction. First, the US Senate drafted and passed the American Service-Members' Protection Act (ASPA). The ASPA ensures that American military members cannot be brought before the ICC, while also banning any US financial contribution to the ICC (Bosco, 2014). Furthermore, the bill made it a requirement "to cut military and economic aid to states not willing to pledge that they would not turn Americans over to the court" (Bosco, 2014, p. 71). Possibly the most "controversial provision" of the bill

authorised the president of the US to take "all necessary means" to free any American service member held by the ICC (ASPA of 2000, 2002 as cited in Bosco, 2014, p. 71). Matters continued a step further when the US brought these concerns into the chamber of the UNSC. They persuaded other UNSC members to adopt resolutions 1422 and 1487, which excluded military forces of non-member state parties from ICC jurisdiction (Bosco, 2014; Knottnerus, 2014). The US put further pressure on the other UNSC members to adopt these resolutions by threatening to veto all UN peacekeeping operations (Bosco, 2014). The US took these steps because a referral to investigate politicians or military personnel by the ICC could shatter the country's reputation and sever its political affiliations (Ramsden & Chung, 2015). US politicians understood that by remaining as a signatory to the Rome Statute, Americans could be put on trial for war crimes.

If the US was a member of the ICC, its behaviour and tactics could be legally scrutinised. In the Rome Statute (1998) under Article 7, the wording explicitly denotes *torture* as a crime against humanity and explains that torture "means the intentional infliction of severe pain or suffering, whether physical or mental, upon a person in the custody or under the control of the accused" (p. 4). The US has detained many prisoners of war and tortured these inmates - physically and mentally - at Guantanamo Bay, Cuba. Under Article 8, the Statute states that "wilfully depriving a prisoner of war or other protected person of the rights of fair and regular trial" constitutes a war crime (Rome Statute, 1998, p. 6). The Statute, then, directly conflicts with the controversial punitive measures that the US has taken against its enemies.

The Rome Statute further describes other war crimes that the US has undeniably committed. A recent example is the bombing of a Doctors Without Borders hospital in Kunduz Province, Afghanistan on October 3rd, 2015. Article 8 in the Statute assigns war crime status to "attacking or bombarding, by whatever

means, towns, villages, dwellings or buildings which are undefended and which are not military objectives" (Rome Statute, 1998, p. 6). The ICC cannot legally investigate this attack because the US does not fall under the ICC's jurisdiction.

The ICC cannot persuade the US to become a member state, and so this case highlights a fundamental shortcoming of the ICC's operations. Regarding actions by the US to protect its troops, Jessberger and Geneuss (2012) assert that their "approach seems questionable and runs counter to the integrative function of the ICC as a criminal court expressing the shared values of all of humanity" (p. 1092). Having one of the world's largest and most well-equipped militaries, the power of the US could be seriously compromised by an ICC investigation. Therefore, the American government took great strides to distance itself from the ICC. If it had not done so, several high-ranking individuals, including former President George W. Bush, would be at risk of being convicted for war crimes, destroying the country's reputation. When some states cannot be prosecuted, the ICC – as an institution created to uphold international justice – cannot completely carry out its mandate.

Conclusion

As can be seen in the Uganda case, the success of the ICC can have far-reaching positive effects. However, not all of the former LRA leaders have been prosecuted because they have evaded capture. Regardless, the LRA was weakened by the ICC referral, which pressured Sudan to comply with Uganda's demands to stop the guerrilla attacks. Other states in the region followed suit by submitting referrals of their own.

The US case shows the limits of the ICC's judicial power, but this limitation cannot be directly attributed to failure of the ICC itself. The US left the Rome Statute, and it went to extreme lengths to protect itself from ICC jurisdiction. However, US actions reflect the success

of the ICC by highlighting that there *are* criminals in the upper tiers of the US government who fear punishment under the same laws that govern all war criminals.

International criminal justice cannot be the ICC's sole responsibility, but rather it needs to be one tool out of many to uphold international justice against criminals (Akhavan, 2013). As well, many critics argue that the ICC has presided over too few cases, but this claim is made in error. Jessberger and Geneuss (2012) assert that "the ICC would be a 'major success' if the number of cases that reach the ICC happens to be: Zero" (p. 1083). If no cases were submitted, this would mean that national judicial systems are strong and international criminal justice is being upheld. Ultimately, the ICC's design intends for it to be a court of last resort. Only when national judicial systems lack the capacity or fail to address cases should the ICC intervene.

The ICC is necessary and invaluable for world justice. Although not all states are members, the ICC plays a crucial role to keep states, both members and non-members alike, in check because of its mere presence. Further demonstrating its universal importance, many states have changed their judicial systems to incorporate international justice within their mandates (Jessberger & Geneuss, 2012). This ultimately shows the broader effects of altered political landscapes and strengthened state justice systems.

The ICC will continue to play a crucial role in the future for international criminal justice. For example, preliminary examinations of potential cases in Afghanistan, Colombia, Georgia, Guinea, Honduras, Iraq, Nigeria, Palestine, and Ukraine are underway (Karns et al., 2015). These new cases provide further opportunities for internationally recognised standards of justice to prevail. The ICC *is* a symbol of justice and is fundamental in upholding an international rule of law against criminals.

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Constructivism and Drones: Evaluating U.S. Drone Policy

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The United States is the largest owner and user of advanced militarised drones in the world (Nicoll, 2009). Drones have featured prominently within both the George W. Bush and Barack Obama administrations. This prompts the question: why does the United States heavily depend on offensive drone technology? Developing an understanding of the motives behind drone use helps to explain the policy objectives of the United States (Rise of the Drones, 2010). However, meagre attention has been devoted to examining which theoretical framework explains American drone behaviour.

Drone warfare is commonly understood as a means by which the American government can strengthen national security (Shaw, 2013). But, militarised drones possess another utility for the United States: control over its military narrative. The home-front plays an important role in the creation of American foreign policy because the military needs to act somewhat within the moral confines established by the public. Thus, the U.S. struggles with the growing normative difference between society and government over violence in military operations abroad.

This article contends that to combat this

trend, the United States uses weaponised drones to conceal its conflicts' contentious aspects from the home-front. Through drone policies, the government has aimed to manipulate the politically relevant forces within American society and secure their support. To substantiate these claims, the article will highlight how the United States controls the domestic media's commentary on the drone programme, characterises its drone programme through naming protocols, and abstains from using national soldiers within combat scenarios. These phenomena will be analysed using the theory of constructivism as espoused by Gil Merom. By contributing to the extensive literature published regarding American drone usage, this article helps to identify important factors that determine U.S. policy.

Theory Review: Gil Merom's Constructivism

Constructivism is an influential approach within current international relations scholarship. A key theorist within this school of thought is Gil Merom, who contends that state security is socially constructed, therefore the dynamics of national security are subsequently shaped by ideational factors such as norms and identities (Merom, 2003).

Furthermore, Merom (2003) posits the importance of the home-front in the creation of a Western state's foreign policy. The conduct of "small wars", Merom maintains, has become incompatible with the political and cultural views of Western societies. There presently exists a normative difference between Western states and their publics regarding issues of violence. Thus, the Western powers' ability to engage in "small wars" has become dependent on whether they can simultaneously control the conflict's narrative and compartmentalise its contentious aspects from their respective societies.

To create and mould the narrative surrounding Western States' foreign war efforts, the ruling administrations advance information aimed at delegitimising an insurgency. The agenda of this action is twofold: Western governments are portrayed as moral arbitrators and defenders of international justice while, contrastingly, their enemies are dehumanised and depicted as morally culpable. Consequently, the state suggests that the insurgency is underserving of society's lawful protection, which allows Western powers to mobilise public support and marginalise local opposition to the conflict (Merom, 2003). This manipulation of the politically relevant forces within society helps administrations attain their policy objectives.

Western governments also control their conflict narrative by compartmentalising "small wars" from their home-fronts. This helps to manage the conflict and its associated costs. For instance, state authorities often monopolise the supply of information to their societies to enhance operational secrecy. When soldiers, particularly those from wealthy backgrounds, are killed or injured on the battlefield and their personalities are publicised in the media, domestic opposition to the war effort increases. Thus, to counter this anti-war sentiment, Western states will increasingly avoid using national troops in combat situations (Merom, 2003).

In summary, Western powers adopt policies that curb domestic challenges to both the morality and rationality of their foreign policy objectives. These policies are designed to liberate their armed forces from the moral restraints that prevent the use of excessive brutality on the battlefield (Merom, 2003).

Shaping the Media Commentary of the U.S. Drone Programme

Militarised drones have become the centrepiece of the United States' counterterrorism strategy. However, due to the geographic expansion of the programme and the additional targeting of American citizens abroad, drones have raised legal and ethical questions and attracted increased media coverage within the United States (McKelvey, 2013). In response, the government has reshaped its relationship with the national media. This has helped the U.S. mould the media commentary of its drone programme.

To achieve this objective, the government has restricted information that is domestically disseminated about the drone programme. For instance, at the advent of the programme, administration officials allowed journalists to interview drone operators. However, further media access to bases was denied after a 2009 *Washington Post* article about the encryption of drone feeds was published. According to an unidentified United States military official, the author Ellen Nakashima had "gone too far" with her description of the drone programme and purportedly embarrassed the government by revealing sensitive information (McKelvey, 2013, p. 12). This information challenged the government's crafted image of the conflict and consequently undermined the operational security of the programme.

This trend of limiting information is also illustrated by the prosecution of informants by the Barack Obama Administration. Within the first four years of his presidency, Obama had prosecuted six cases of governmental leaks (McKelvey, 2013). This suppression was designed to frighten journalists and administration technocrats from reporting on the United States' counterterrorism activities such as the drone programme. Subsequently, minimal information that portrays the government negatively has surfaced to date. The ethical problems associated with the drone programme are highlighted by the language of John Brennan, the President's counterterrorism advisor. Upon instructions from "President Obama... to be more open" after increased domestic criticism, Brennan acknowledged that "the issue of targeted strikes [raises] profound moral questions" (McKelvey,

2013, p. 18). Despite this concession, *Reuters'* Warren Strobel argues that the government has minimised public scrutiny by remaining increasingly opaque about the programme (McKelvey, 2013, p. 19). Similarly, Tara McKelvey (2013) contends that enhanced domestic transparency about the drone programme would undermine its achievements.

These developments support Merom's theory that suggests international relations are socially constructed. The United States has shrouded its drone programme in secrecy to ensure the programme's successfulness. By monopolising the supply of information on drone assaults, the United States government has shaped the public's perception of its "small wars". This subsequently helps to curtail domestic opposition stemming from society's moral norms.

Characterising and Labelling Drone Strikes

Weaponised drones have significantly altered the technological politics and governance of warfare within the United States. Drones represent an important feature within the evolving relationship between surveillance and militarisation. The U.S. has widely adopted these devices due to its desire for technological superiority, objectivity, and control (Wall & Monahan, 2011). By depicting conflicts through this impersonal prism, the U.S. government has desensitised the American public to the war effort, freeing the government to increase its targeted killings (Wall & Monahan, 2011).

This development is evident in the way that government officials characterise the U.S. war effort. For instance, the United States dictates the classification system used to note casualties resulting from drone strikes. According to a report in the *New York Times*, the U.S. records all military-age males in strike zones as militants (Becker & Shane, 2012). This categorisation method presumes that individuals within close proximity to the targeted actor are also insurgents. The U.S. rationalises this approach, according to an official who requested anonymity, by claiming that insurgent groups are "insular, paranoid organisation[s] - innocent neighbours don't hitchhike rides in the back of trucks headed for the border with guns and bombs" (Becker & Shane, 2012, para. 43). This guilt by associa-

tion has subsequently led to deceptive estimates of civilian casualties (Becker & Shane, 2012).

Furthermore, the United States' desire to consistently define the content and context of its weaponised drone programme is illustrated by its labelling of the targeted killings. For example, drone assaults on high-value targets and groups of militants are named "personality strikes" and "signature strikes" respectively (Hastings, 2012, p. 5). These terms contrast heavily with the lethal nature of the strikes and reduce the negative reactions associated with assassination. This humanises such technologies, which consequently makes drones more amenable within the public sphere. In his article entitled "The Costs and Consequences of Drone Warfare", Michael J. Boyle (2013) contends that these policies of indiscriminate killing contradict the normative legal and ethical foundation of modern warfare. However, by advancing this categorisation method, the U.S. government nurtures a growing indifference within its citizenry towards drone targets.

Eschewing of National Soldiers Within Combat Situations

Drones have rapidly transformed the United States' method of warfare away from deploying conventional soldiers. This has significantly reduced the American home-front's investment in military actions, minimising its influence over this sphere (Hastings, 2012). The importance of offensive drones to the United States is illustrated by the positive descriptions of the drone programme by government representatives.

U.S. officials have framed drones as devices that protect American servicemen. For instance, Senator Dianne Feinstein, chairman of the Select Committee on Intelligence during the Obama Administration, has highlighted positive outcomes from the programme. Feinstein notes that drones, due to their rapidly growing sophistication, have allowed the United States to achieve its strategic objectives "without having to send in a special ops team or drop a 500-pound bomb". This has subsequently moved "a lot of Americans out of harm's way" (Miller, 2011, p. 2). Furthermore, the efficacy of drones is underscored by the rhetoric of Daniel Goure, a national security expert who served in the De-

fense Department during the George W. Bush administration. Goure asserts, "Before drones, the way you went after terrorists was you sent your troops... [your] Navy...[and] your Marines". Now, the United States uses "drones that can be operated by the military or the CIA from thousands of miles away". Goure concludes, "The major success of the drones is in keeping American soldiers alive"(Hastings, 2012, p. 3-4).

Various scholars have contended that drones help the United States minimise its military deaths. According to Michael Hastings (2012), drones allow the United States to curb public discomfort over U.S. casualties incurred on the battlefield. Likewise, Peter W. Singer (2012) posits that drone technology has increased the United States' ability to wage war by avoiding the political consequences associated with sending Americans combatants into harmful situations. He further asserts that by minimising the impact that military casualties have on voters and the national media, Americans dismiss "small wars" as possessing tangible consequences (Singer, 2012). Consequently, a narrow debate has emerged within American society regarding the technology's destructive capabilities (Miller, 2011).

These actions by the U.S. government demonstrate key aspects of Merom's constructivist theory. By reducing the use of combat troops and increasing drone strikes, the U.S. government has controlled society's perception of its small, geographically localised conflicts abroad. This has curtailed domestic challenges to the United States' foreign policy agenda.

Conclusion

In conclusion, the constructivist theory of Gil Merom illuminates the motives behind the United States' drone policies by emphasising how the home-front plays a paramount role in shaping the militaristic capabilities of the United States. To reduce society's objection to violence within military operations abroad, the U.S. government has attempted to control the military narrative of its drone conflicts. By controlling the domestic media's commentary of its drone programme, characterising the drone programme as positive, and abstaining from using national soldiers within combat scenarios, the government moulds its conflict narrative and compartmentalises its contentious aspects from the public. Accordingly, this has secured the support of the politically relevant forces within American society.

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Meanings of Mining

Towards a Socio-Political Approach on Small-Scale Gold Mining in Ecuador

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Photo: Jose Luis Maldonado Quintero

Artisanal and small-scale gold mining (ASGMⁱ) has received increased attention from scholars, activists, and the public during the last decade. This attention correlates with increased gold prices that peaked in mid-2011 when a gram of gold was valued at almost 60 US dollarsⁱⁱ. The general picture of ASGM is that it involves mining carried out in remote areas with few resources and that it is a dangerous activity causing severe environmental contamination, in particular through the release of mercury and sodium cyanide used in the process (Hentschel, 2002; Sinding, 2005). It is estimated that ASGM employs 16 million miners in the world (Seccatore et al., 2014). This supports 100 million people (de Theije et al., 2014). Although ASGM only produces between 380 and 450 tonnes of gold, which accounts for 10-15 percent of total annual gold production, the environmental impact is disproportionately large since it contaminates many river systems throughout the world (Miserendino et al., 2013). A major obstacle to effective control and regulation is attributed to its informal character as a form of poverty alleviation, representing a significant economic opportunity for people in impoverished regions.

ASGM has a long history in Latin America, especially in the form of alluvial mining before and after the Spanish conquest. The oldest and largest ASGM district in Ecuador is located in its South-Western corner in an aptly named province, El Oro (English: The Gold). Here, in the mountains around the towns of Zaruma and Portovelo, gold mining has been carried out for more than five centuries. This legacy of mining is carried by contemporary miners who, faced with increased state regulations and fluctuating gold prices, struggle to maintain their source of livelihood.

In this article I present an empirically grounded analysis of mining regulations and mining practices in Portovelo-Zaruma (hereafter P-Z). I do this in a political ecologist framework with an emphasis on local history and socio-political dynamics. There are two main reasons to apply such a perspective. The first stems from the observation that the mining community of P-Z finds itself entangled in a process of environmental degradation and social marginalisation, which is a major theme within the litera-

ture of political ecology (cf. Robbins, 2012). The second reason comes from the observation that the existing literature on the context is dominated by natural sciences on toxicity and technical features of the local mining. Accordingly, there is a need for social and political perspectives to complement this and to engage critically with what is going on in P-Z.

In other words, instead of merely identifying the mining praxis as contaminating and unsustainable, I suggest we take one step back and ask: How does local history influence current mining identity and praxis? How is legislation and regulation conceived from a local point of view? How does current regulation impact its objective? I argue that by answering these questions and by incorporating an understanding of legal pluralism, in which laws and norms have both theoretical and practical lives (de Theije et al., 2014), this provides for an improved conceptualisation of the context. Furthermore, although this paper represents a specific case, it should be conceived as a comment on the role of extractive industries in Latin America and, in the tradition of political ecology, on the relationship between nature and societyⁱⁱⁱ.

I will start by briefly describing the constituents of ASGM and continue with a historical outline of the mining activity in P-Z. Thereafter, I discuss the current characteristics of the mining community and the controversy surrounding the use of mercury. I do this by drawing on empirical data collected on fieldwork during July-September 2015 and January/February 2016.

ASGM

Much of contemporary ASGM is carried out along the tropical belt, including nations like Indonesia, Tanzania, Ghana, Brazil, Colombia, Peru, and Ecuador. As mentioned above, there are several challenges related to this activity due to a combination of ASGM alleviating poverty while harming the environment. Epitomising this, the sector is currently the largest consumer of mercury in the world, using approximately 1400 metric tonnes a year (Veiga et al., 2015). Facing tremendous challenges in relation to control and regulation, it seems like a reasonable question to ask, as some researchers do, if

clean ASGM is a utopian approach (Hinton et al., 2003)?

Meanwhile, the research in this field is still engaged in improving the conditions for the sector, and a number of suggestions and collaborations have surfaced. For instance, an interdisciplinary alliance has worked towards the mitigation of mercury damage (e.g. Telmer & Veiga, 2009; Seccatore et al., 2014; Veiga et al., 2015). This mitigation was recently advocated through the formation of the Minamata Convention^{iv} in 2013. However, as Hilson (2006) pointed out already ten years ago, the progress is slow, if existent at all on a global scale. Accordingly, the efforts to alleviate the environmental impact of ASGM resemble that of the efforts to combat global warming: a lot of work, talk, and treaties, yet few improvements.

Two main scholarly tracks are often combined when targeting ASGM. The first is an empirical critique of the technologies employed by the miners and suggestions on how to improve this (e.g. Seccatore et al., 2014; Veiga et al., 2014; 2015). The second is a critique of the legal frameworks in which the sector operates. In this literature, large-scale mining is often the target, while ASGM is included in order to scrutinise contradictions, inconsistencies, and property rights in relation to mining legislation^v. Although this work constitutes a major contribution to the on-going research, there is less work that displays what Hilson suggests as: “(R)esearch which aims to improve understanding of the dynamics of mining communities, and elicits feedback from operators...” (2006, p. 12). In other words, there is little research that aims to inform us on themes like “the cultural logics of illegality” (High, 2012) with an emphasis on the ethnographic account. Rather, what researchers refer to as “empirically grounded analyses” (Arsel et al., 2014, p. 109) tends to focus on legislation linked to politics instead of linking it to observations of its implementation. That is not to say that the deconstruction and analysis of mining laws, constitutions, decrees, and mining politics lacks importance or relevance. However, the data I am presenting here suggests that what goes on in situ has its own dynamics and that legislation from above creates resistance as much as compliance. It is, to put it differently, quite

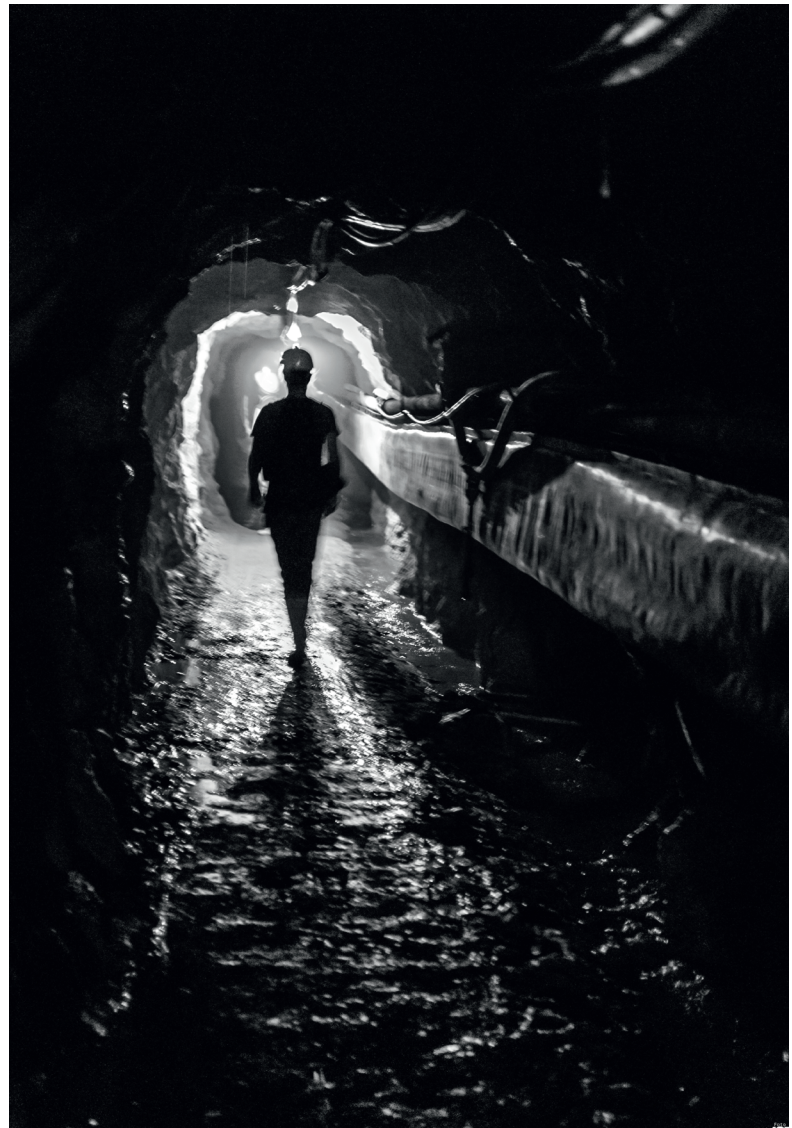


Photo: Jose Luis Maldonado Quintero

naïve to assume, as some researchers do, that national laws and legislation control this sector and that things will improve once the apparent contradictions and ambiguities are described.

De Theije et al. (2014) acknowledge this when discussing what they call “engaging legal systems” (p.129). Here the writers conceptualise ASGM as an activity occurring in a situation of legal pluralism where state legislation is but one of several “laws” (customary/local laws, community regulations) organising the sector. They make two important distinctions when treating the term legal pluralism (De Theije et al., 2014). The first is the distinction between *de jure* and *de facto* where the former is the legal pluralism reflected in official national law, while the latter is the social-normative legal pluralism that can be found empirically. This leads to forms of interlegality (Thomas, 2009), which is, I would argue, a much more “down to earth” and realistic conceptualisation of any given ASGM site. Second, they make a distinction between illegal and illicit practices where the former refers to *de jure* illegality at odds with national law, while the latter refers to practices that are socially unacceptable, *de facto*.

This framework stresses the presence of plural rationalities (economic, cultural, traditional, and religious) shaping the formation of norms that in turn, negotiate the legal framework of the mining sector. It differs from what Miserendino et al. (2013), following Ostrom et al. (1999), identify as the problem of addressing jurisdictionally varying impacts. In this instrumental approach, the authors conceive of environmental impacts across jurisdictional territories as requiring an agreement on the legal hierarchies and institutional set-up (particularly cost distribution). While they rightfully problematise the complexity of *de jure* legislation across national borders and in its Ecuadorian context, de Theije et al. (2014) respond more to the informal and social characteristic of ASGM. In the latter, which is the one I am following here, the observation that “people make their own rules” through negotiations between official legislation and local norms is included in the analysis.

The economic incentive related to ASGM is indeed a major and immediate expla-

nation as to why people mine for gold. However, there is also a political economy to this, and as the next section will show, a history that indicates that the choice of gold mining as a means for subsistence is far from accidental, but a livelihood orientation sustained and consolidated through centuries of mining activity.

Portovelo-Zaruma

The neighbouring towns of Portovelo and Zaruma are located up-land of the El Oro province—the latter at 1200 masl., and Portovelo situated below (a ten-minute drive) in a narrow valley at 600 masl. Taken together, the towns with their respective cantons contain approximately 35 000 people. Out of this population, mining directly employs between 6000 (Miserendino et al., 2013) and 10 000 miners (Veiga et al., 2014) depending on the estimates used. These miners engage in a variety of operations, ranging from alluvial and artisanal subsistence mining with little investments, to mid-sized industrial mining, processing more than a thousand tonnes of ore a day^{vi}.

The mining operations are categorised according to the Ecuadorian Mining Act of 2009^{vii}, in this case as small-scale and artisanal miners, and must accordingly comply with a number of rights and duties. Without going into details, the actual composition and organisation of this sector is both complex (e.g. formal/informal mining, property rights/concessions, discrepancies between reported and actual production, illegal gold commerce) and dynamic (contracts shifting hands; the making and un-making of mining cooperatives/associations; and workers changing companies, categories, or simultaneously engaging in a variety of operations and/or occasionally engaging in other activities).

The development of ASGM in Ecuador can be defined into three historical movements: 1) the emergence of informal ASGM in P-Z in the late 1970s, 2) the re-discovery of gold deposits in Nambija and Ponze Enriquez in southern Ecuador during the 1980s, and 3) the consolidation of these three ASGM sites through the establishment of processing centres and new organisational business structures during the 1990s (Sandoval, 2001). Here I focus on the first

by outlining its historical trajectory.

Despite a lack of archaeological studies in P-Z, there are many archaeological sites to visit. And regardless of the lack of archaeological research, it is commonly agreed that alluvial gold mining was practised among indigenous people prior to the Incan conquest during the 15th century (Murillo Carrión, 2010). This trait facilitated an expanding continuation of gold mining by the Incas (Astudillo, 2007). This dynamic was repeated a century later with the arrival of the Spanish conquistadores who founded the city of San Antonio del Cerro Rico de Zaruma in 1549. During the first decades of the colonial epoch, hopes were high, and the rich mountains of Zaruma were exploited using indigenous workers as manpower. Yet soon enough, problems emerged, most of them related to the lack of available work force and to a notorious lack of investments. An informal sector parallel to the colonial organisation was established in the beginning of the 17th century (Murillo Carrión, 2010). Likewise, the use of mercury to process the ore, along with worried testimonies about exposure and its malignant health consequences, was reported already at this stage (Murillo Carrión, 2010; Lane 2004).

With independence in 1830 and the first decades of the Republican era, gold mining was carried out by local creoles and mestizos using rudimentary techniques and only exploiting the upper levels of the surface. Yet, there were no doubts about its mineral reserves, which was documented by the German scientist Theodor Wolf in 1876 (Astudillo, 2007). Wolf's encouraging report attracted both interests and investments during the next twenty years. The mines were exploited by a mixture of national and foreign initiatives, highlighted by the arrival of the English company Great Zaruma Gold Mining in 1880 (Astudillo, 2007).

This development gave ground to an unparalleled period in Ecuadorian gold mining with the arrival of the South American Development Company (SADCO) in 1896. This company acquired the concessions of the English company and established itself in Portovelo, applying an industrialised mining regime far more sophisticated and larger than any prior attempts. SADCO remained in Portovelo un-

til 1950, and its story is thoroughly documented (e.g. Astudillo, 2007; Murillo Carrión, 2010; Paredes, 2013). Although royalties and taxation to the Ecuadorian State were notoriously low, the socio-economic impact of SADCO was prominent to the region. It represented the first capitalist system at work on Ecuadorian soil, an introduction to North-American culture (commodities, sports, and architecture), and notable infrastructure (mining facilities, potable water, houses, roads, and railroad) only comparable to the largest cities. By the end of the Second World War, the company had a work force of 1445 persons (Astudillo, 2007). Predictably enough, there were several conflicts between the administration and its workers, resulting in two major strikes in 1919 and 1935 and several violent incidents (Paredes, 2013). However, due to increasing governmental demands for tax and royalties, the company left in 1950. It was replaced by CIMA, a mixed enterprise between ex-workers of SADCO and the municipality of Zaruma. CIMA operated the old mines and processed the old tailings of SADCO until 1978 when the company went bankrupt due to a drop in gold prices and poor administration. Since this point in history, the mines of P-Z and the adjacent communities have been subjected to a diverse and expanding ASGM.

In P-Z, old people, some of them previous employees for these companies, are still engaged in daily life and mining issues. This generation has been followed by a generation of ASGM miners who have built upon the extensive knowledge of the former to become highly competent and creative miners. Furthermore, the mining has proved itself extremely tenacious; despite all the profound political, economic, and cultural changes during the last 500 years, there is an un-broken continuity of mining ever since the Incan conquest. Confronted with the questions of current regulations of this sector, this history points out that informality and the use of mercury to process the ore has been part and parcel of this context from its very inception, i.e. at least for 400 years. To borrow the classic sociological concept of *habitus* (Bourdieu, 1977), informality and mercury are components in a mining practice that has been internalised, embodied, and institutionalised among



Photo: Jose Luis Maldonado Quintero

local miners to become structured structures. In this perspective, ASGM is constituent of people's identity regardless of its dangers, its environmental consequences, and external critiques. Here, gold and gold mining is life-giving (cf. Nash, 1993).

In the following section I turn to analyse an event that illustrates an explicit case of local resistance to increased regulations. Although a number of issues were raised this day, I focus on the controversies surrounding the use of mercury. It is important to note, however, that everyday resistance against regulations is predominantly carried out through illegal practice (*de jure*) and that the phenomenon of corruption works as a mediator between regulators and miners (*de facto*).

Present Times and Present Conflicts

On the 23rd of July 2015 there was a demonstration on behalf of the mining community in Portovelo and its neighbouring districts. The demonstration was organised by APROPLASMIN (Association of Owners of Processing Plants) and consisted in a peaceful march through the town, a stop with an appeal outside ARCOMs (The Ecuadorian Agency of Control and Regulation of Mining) office, and a press conference outside the APROPLASMIN headquarters. Approximately two thousand people attended: miners and workers, but also merchants, shopkeepers, chauffeurs, restaurant owners, and housewives from the local communities. Besides general complaints of the regulatory praxis, a central preoccupation for the protesters was the prohibition of mercury. Although the prohibition remains in an undefined legal status^{viii}, there are few prospects of tangible alternatives to the use of mercury. In particular, this was a concern for the great numbers of legal and illegal artisanal miners who blamed INIGEMM (Ecuadorian Institute of Metallurgical Mining Geological Research), the responsible entity, for pushing a ban on mercury without presenting alternative processing techniques.

Importantly, artisanal miners depend on processing their ore (usually a small amount of high density ore) in one of the 87 processing plants owned by larger operators. Until recently, the conventional procedure for this has been

through the use of small, ball mills where mercury is used to capture the gold. This is acknowledged as relatively inefficient (but fast), and the artisanal miners only obtain about 40 percent of the gold while leaving their tailings as part of the payment for the process. These tailings are subjected to another round of processing, normally using cyanide sodium and activated carbon, where the rest of the gold and silver is separated and refined^{ix}. This scheme illustrates the key position of the processing plants and their entrepreneurial traits. It also illustrates a hierarchical trait in the local mining sector where the processing plants who do a poor amalgamation process for the artisanal miners are also the ones making the most money since they extract more gold in the second round of processing (cf. Miserendino et al., 2013).

Meanwhile, despite the protests, INIGEMM's involvement in P-Z has taken place since its founding in 2009 and prior to this through its predecessors: DGGM (Dirección General de Geología y Minas) and CODIGEM (Corporación de Desarrollo e Investigación Geológico Minero Metalúrgico). These institutions have facilitated collaboration with foreign and national researchers^x and attracted both capital and capacities to improve the mining praxis of P-Z^{xi}. Ironically, in the context of this demonstration, INIGEMM was nevertheless portrayed as an arrogant, scientific elite, evoking a paternalistic discourse of increased regulation and thus taking a stand with the Ecuadorian State paying their salaries. The reasons for this can be traced back to a collective, local stand against external authorities imposing unrealistic legislation by a top-down approach. From the local point of view, the decision to adjourn the prohibition of mercury was, at best, because of the appeal and the local counter-mobilisation.

Echoing the element of opposition towards external actors, an argument that is repeated thoroughly in P-Z is that the largest companies may provide steady fiscal incomes in the form of royalties and taxes, but as in the case of ELIPE Ltd. (the largest operator), their profit ends up in corporate hands in other countries. Meanwhile, whilst royalties and tax paid by local and smaller mining companies/cooperatives are less, the profit from these companies

is reinvested in the local economy and indirectly contributes as much, or perhaps even more, to the Ecuadorian economy. Moreover, local miners hardly forget that President Rafael Correa was present as he blessed the inaugural session of ELIPE Ltd. Yet, they wonder about the ambiguities embodied by the president who has publicly and repeatedly announced that “we (i.e. Ecuador) cannot be beggars sitting on a sack of gold” (de la Torre & Ortiz Lemos, 2015, p. 9) while at the same time representing a set of regulations that threatens to eradicate the dimension of poverty alleviation in the local mining sector.

As for now, the result of the prohibition of mercury is that artisanal miners burn their gold-mercury amalgam privately in the countryside to avoid regulating authorities in the processing plants. This causes increased air pollution and is a testimony of failed legislative implementation. Additionally, the governmental bias for large and external operators creates a process of marginalisation for smaller, local operators and a general resentment towards the state. This resentment is expressed in daily life. However, an important effect is that it creates distance between regulators and miners, a distance that in turn enhances hierarchies within the local sector and strengthens the positions of processing plant owners. If we conceive this through the above-mentioned framework of de Theije et al. (2014), this consolidates the informal character of ASGM and boosts the illegal economy in opposition to the government's enforcement of national mining legislation.

Concluding Remarks

ASGM permeates the societies of P-Z and constitutes a long-standing target for livelihood orientation in the absence of feasible alternatives. The historical trajectory displays how this orientation has been consolidated through different stages of the local mining. The outcome is a proud, collective mining identity with close affiliation to both place and mining. Accordingly, local miners are ambitious to have a stake in the decision-making and/or continue to mine regardless of increased, top-down regulations from central authorities. If this is not accounted for in the efforts to implement legislation, which

is highly problematic in itself (cf. Miserendino 2013; Arsel et al., 2014), no progress can be expected in this context. Without balancing the privileges of large, external actors, state regulations will continue to be marked by marginalisation towards artisanal miners and prove effectively redundant, i.e. creating more problems than it solves.

It is tempting to join the choir of political ecologists pointing their critical finger at the actions of extractive corporations and the government facilitating this, and I agree that this is a substantial problem in this context as well.

However, this paper has shown that it would not be entirely consistent with empirical findings. As noted, one of the consequences of the situation in P-Z is the opportunistic practice among the owners of the processing plants. I have illustrated how they exploit artisanal miners and have power to mobilise large demonstrations against increased state regulations. Accordingly, any improvement to the social and environmental conditions of the ASGM in Portovelo-Zaruma relies heavily on a negotiation with these actors.

Endnotes

ⁱ There is a problem of definition of both artisanal and small-scale mining and the distinction between them (see Veiga et al., 2015, p. 1). The Ecuadorian Mining Act, however, follows a definition that highlights the volume of production as the determining factor; although it also mentions what kind of machinery can be used in artisanal exploitation (Art. 134). Nevertheless, the concepts of artisanal and small-scale are employed inconsistently among miners as well as scholars writing about them.

ⁱⁱ Currently (March 2016) the gold price is stable around 35 US dollars a gram.

ⁱⁱⁱ In the context of Ecuador, this debate has had a considerable momentum since president Rafael Correa came into power in 2007, and more generally with the "Left Turn" in Latin American politics (Castañeda, 2006; Ardití, 2008; Escobar, 2010). A major point of departure has revolved around inconsistencies and contradictions in a political project that has exhibited increased environmental concern yet simultaneously increased its extractive sector (e.g. Escibano, 2013; Bavinck et al., 2014; Pellegrini et al., 2014).

^{iv} The Minamata Convention on Mercury is a global treaty to protect humans and the environment from the harmful effects of mercury exposure. See: www.mercuryconvention.org

^v See Hilson (2006) on research/policy agendas in relation to mercury abatement; Miserendino et al. (2013) on different challenges related to cumulative impacts of ASGM in general, yet specifically in P-Z; Arsel et al. (2014) on property rights and nationalization in Ecuador/Bolivia; and Nichols et al. (2015) on the geo-political tensions between Ecuador and Peru due to contaminated rivers in P-Z eventually entering Peruvian territory.

^{vi} ELIPE Ltd., a Canadian subsidiary of DYNASTY METALS, is the largest company in the region and

the one holding the great majority of mining concessions. ELIPE has a plant capacity to process 2400 tons of ore a day and has, according to its latest report, produced about two tons of gold since 2013 (<http://www.dynastymining.com/investors/fact-sheet>). Curiously, ELIPE avoid being categorised as mid-sized miners (and thus avoid paying more tax/royalties) by reporting less than 300 tons a day (which is the limit for small-scale mining) per concession.

^{vii} Latest, reformed version is from December 2015 (available download from: <http://www.sri.gob.ec>).

^{viii} According to Art. 86 in the Mining Act, mercury is prohibited although its implementation is to await the corresponding decisions of the responsible entities. According to the third transitory disposition of the same Mining Act, the definitive prohibition will occur after a process of two years (this is actually echoed in the 2013 version of the Mining Act).

^{ix} See Velasquez-Lopez et al. (2010, 2011) for detailed and technical reviews on these processes.

^x Particularly the Norman B. Keevil Institute of Mining Engineering at the University of British Columbia and, in Ecuador, the Universities of Machala and Loja.

^{xi} It is commonly agreed that there have been improvements, especially the eradication of child labour and to some extent improved waste and chemical management.

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Photo: Kristoffer Kämpe

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