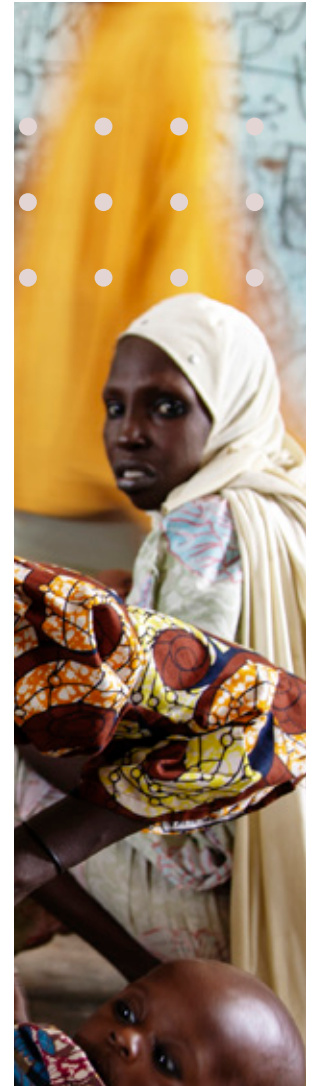
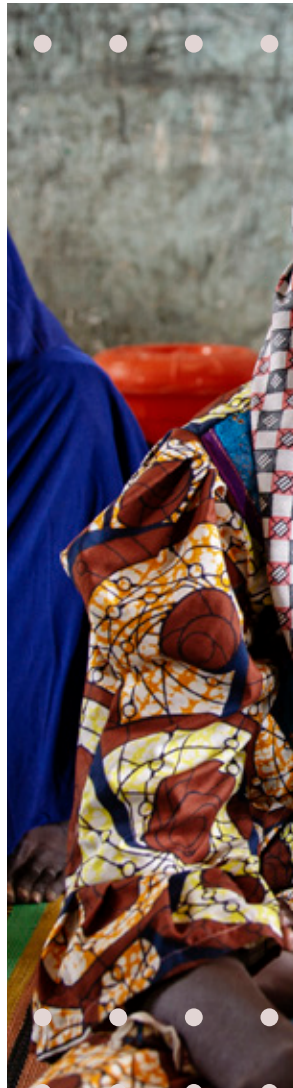
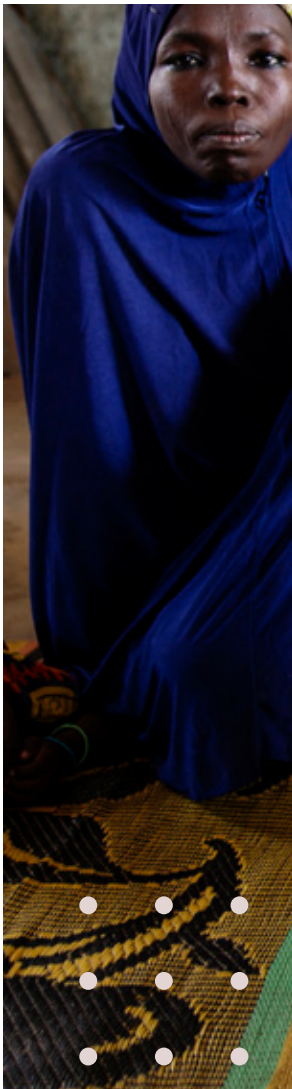


# ASSESSING THE IMPACT OF CONFLICT ON DEVELOPMENT IN NORTH-EAST NIGERIA





United Nations Development Programme

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# ASSESSING THE IMPACT OF CONFLICT ON DEVELOPMENT

IN NORTH-EAST NIGERIA







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# PREFACE

Since 2009, persistent conflict in north-eastern Nigeria has led to the loss of lives and properties, destruction of critical infrastructure, displacement of millions, and the destabilization of economic, health and education systems. These developments have had attendant effects on the productivity and development of the region and the country at large, given scarce national resources.

Insurgent violence and terrorism carried out by Boko Haram and Islamic State's West Africa Province (ISWAP) remain the major driver of insecurity across north-eastern Nigeria and the Lake Chad region. The effects of the insurgency and the persistence of insecurity are inseparable from the region's pre-existing socio-economic deprivation and harsh environmental conditions. The BAY states, Borno, Adamawa and Yobe, were not only some of the poorest states in the country prior to conflict, but they also continue to bear the brunt of its effects.

The Government of Nigeria has made great strides in retaking and stabilizing large portions of the region, but it has had limited success in ending the insecurity and restoring the lives of those affected. Given that a key tenet of Agenda 2030 is that no one is left behind, achieving the Sustainable Development Goals (SDGs) for Nigeria will require addressing the crisis and its developmental impact in the north-eastern region.

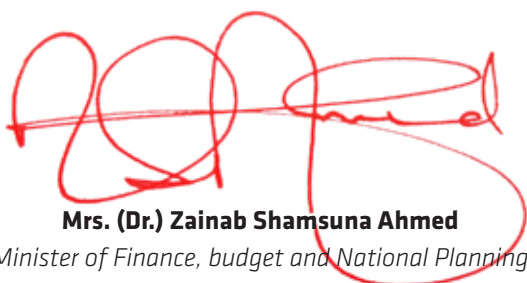
While considerable work has gone into understanding the developmental impact of conflict in the region and elsewhere, this research takes a dynamic and integrated approach to assessing the interacting effects of the conflict and quantifying the future impact of continued insecurity in the region. The purpose of this report is to evaluate how the conflict has altered the region's development trajectory and to project its impact if it continues for another decade, focusing on the most

severely affected BAY states. By comparing these two scenarios (Conflict and No Conflict) using the International Futures (IFs) model, this analysis, carried out by the Frederick S. Pardee Center for International Futures at the University of Denver, is able to evaluate the conflict's direct and indirect effects.

If trends based on data from the Armed Conflict Location and Event Data Project continue, by the end of 2020 armed conflict in north-eastern Nigeria will have directly killed over 35,000 Nigerians. However, for each direct death, an additional nine people (most of them children) will have been killed due to lack of food and resources. Beyond the direct and indirect death tolls, the study indicates that various aspects of progress and development (namely GDP, poverty, malnutrition, infant mortality, education, water availability and sanitation) may not return to pre-conflict levels even by 2030.

Given the multifaceted nature of the root causes of the conflict and the development challenges arising from it, there is need for new ways of working that recognize the complexity and interconnected nature of risks and that adapt quickly to changing circumstances. Cooperation and a multi-pronged approach are paramount in defining and addressing the development challenges arising from the conflict.

This report, commissioned by the United Nations Development Programme (UNDP), is part of UNDP's work on conflict prevention, peacebuilding and responsive institutions anchored in the UN Secretary-General's commitment to building peaceful and resilient societies. We hope this will be a useful resource for understanding and working around conflict to foster the process of stabilization, peacebuilding and recovery in the region.



**Mrs. (Dr.) Zainab Shamsuna Ahmed**  
*Minister of Finance, budget and National Planning*



**Mr. Mohamed Yahya**  
*Resident Representative,  
United Nations Development Programme, Nigeria*



# EXECUTIVE SUMMARY

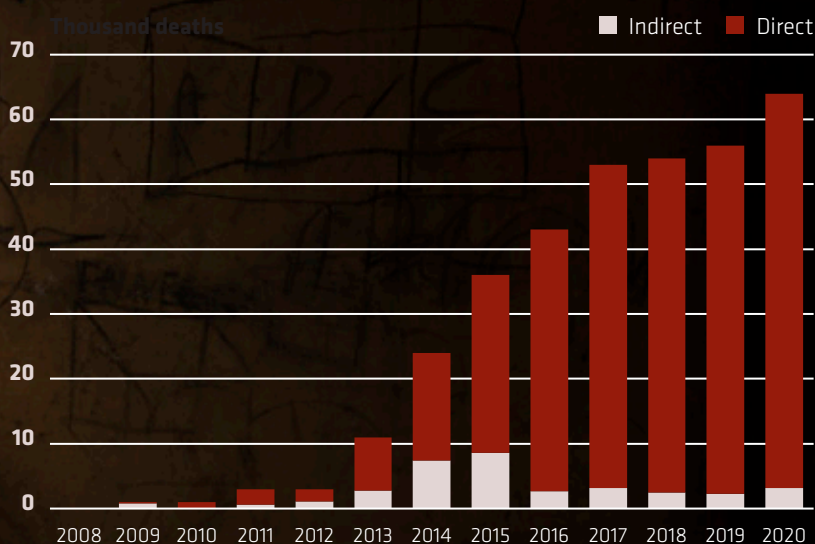
North-eastern Nigeria and neighboring regions have been transformed by conflict that has lasted more than a decade. Even before the conflict began, the region was one of the poorest in Nigeria and faced numerous development challenges. Years of attacks and destruction have led to immense humanitarian, human rights, and development crises, putting the lives of millions on the line. In this report, we assess the developmental impact that conflict has had, focusing on the most severely affected states of Borno, Adamawa, and Yobe (the BAY states).

We use the International Futures (IFs) model, a systems-dynamic integrated assessment tool, to compare two scenarios: a Conflict scenario that simulates conflict and its effects based on the best data and literature available, and a No Conflict scenario that simulates development in a counterfactual without conflict. By comparing these two scenarios, we can evaluate the conflict's direct and indirect effects.

According to national data, conflict has directly resulted in the deaths of 35,000 people in the BAY states as a result of battle or one-sided violence since 2009. However, the full human cost of war is much greater. Already, many more have died from the indirect effects of the conflict. We estimate that through the end of 2020, the conflict will have resulted in nearly 350,000 deaths, with 314,000 of those from indirect causes.

These deaths are the result of the conflict's physical and economic effects. Insecurity has led to decline in agricultural production and trade, reducing access to food and threatening the many households who depend on agriculture for income. Hundreds of thousands of Nigerians have been displaced from their homes, often meaning the loss of livelihoods, assets, and critical support systems. Moreover, displaced populations must often live in overcrowded and degraded living conditions without access to clean water and sanitation. Young children, who are

**Figure 1:** Annual conflict-attributable deaths in the BAY states



Source: IFs 7.52 Nigeria sub-national

especially vulnerable to malnutrition and disease from a lack of clean water, are hit hardest. We estimate that more than 90 percent of conflict-attributable deaths through 2020, about 324,000, are of children younger than five. With another decade of conflict, that could grow to more than 1.1 million.

Table 1 presents key development indicators for both the Conflict and No Conflict scenarios through 2030. These indicators help illustrate both the immediate and lasting damage done by the conflict. We find that under No Conflict conditions, development in the region is expected to improve steadily but slowly, with GDP growth averaging just over five percent from 2008 to 2030. Due to rapid population growth, GDP per capita would grow more slowly, at roughly 1.7 percent on average. Poverty, infant mortality,

and malnutrition would have improved gradually. In the Conflict scenario, the region cannot significantly improve after the shock of heavy fighting and destruction in 2014 and 2015. GDP growth averages 2.5 percent between 2008 and 2030 and GDP per capita does not recover to its 2008 level. While aspects of development do get better, as seen in the slowly improving measures of GDP per capita, poverty, and infant mortality after 2020, they do not return to pre-conflict levels even by 2030.

The consequences of this stalled development, in terms of missed opportunities and lost lives, are immense and will affect the population in the region for decades. Conflict has been especially damaging to education, as schools have been targeted directly by insurgents. In 2020, we estimate that 1.8 million students are out of school who

**Table 1:** Summary of results, reporting human development indicators for Borno, Adamawa, and Yobe states as a group in 2020, 2025, and 2030 for the Conflict and No Conflict scenarios. \*Extreme poverty refers to the population living on less than \$1.90 per day in 2011 USD at PPP. Source: IFs 7.52 Nigeria sub-national.

	Scenario	2008	2020	2025	2030
<b>Direct conflict deaths</b> (cumulative)	Conflict		35,000	48,000	61,200
<b>Indirect conflict deaths</b> (cumulative)	Conflict		314,000	674,000	1,110,800
<b>GDP (MER)</b> billion USD	No Conflict	11.9	18.1	24.9	36.1
	Conflict	11.9	13.0	15.7	19.8
<b>GDP per capita (PPP)</b> thousand USD	No Conflict	2.4	2.4	2.9	3.4
	Conflict	2.4	2.0	2.1	2.3
<b>Extreme poverty*</b> percent of population	No Conflict	57.6	49.9	47.9	43.5
	Conflict	57.6	59.5	59.1	56.4
<b>Infant mortality</b> deaths per 1,000 births	No Conflict	96.9	80.7	69.5	58.7
	Conflict	96.9	122.5	111.1	97.9
<b>Malnourished children</b> percent of children	No Conflict	31.7	27.5	24.9	22.2
	Conflict	31.7	49.0	44.5	37.4
<b>Education years</b> average, population 15+	No Conflict	4.7	5.3	5.4	5.8
	Conflict	4.7	5.0	4.9	4.8



would have been enrolled if not for conflict. By 2030, in the Conflict scenario, the average Nigerian in the BAY states will have had a full year (20 percent) of education less than expected in the No Conflict scenario. This setback in human development will require decades to recover from.

Of course, forecasting the future of conflict is fraught with uncertainty, and the COVID-19 pandemic has added another layer of challenges to an already overburdened region. While we have included updated GDP growth estimates for 2020 to account for the known economic effects of the pandemic, we are not attempting to predict how conflict will evolve. This methodology allows us for the first time to account for the ramifications of conflict in north-eastern Nigeria and assess its consequences in terms of lives lost and missed opportunities.

Armed conflict in north-eastern Nigeria will have killed over 35,000 Nigerians by the end of 2020. But we estimate that for each death due to violent conflict, nearly nine more have been killed due to lack of food and resources. These preventable deaths are largely of children younger than five. And for every year that conflict continues, the burden is felt increasingly by infants and children. Every day of continued conflict in 2020 takes the lives of 170 children under five. By 2030, that grows to 240. Destruction and displacement have set back development in the region by decades, and continued conflict will only further scar the region.



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# ABBREVIATIONS USED IN THIS REPORT

<b>ACLED</b>	Armed Conflict Location and Event Data Project
<b>BAY</b>	Borno, Adamawa, and Yobe
<b>COVID-19</b>	coronavirus disease
<b>GDP</b>	gross domestic product
<b>IDP</b>	internally displaced person
<b>IFs</b>	International Futures
<b>ISWAP</b>	Islamic State's West Africa Province
<b>JAS</b>	Jama'atu Ahlis Sunna Lidda'awati Wal-Jihad
<b>LGA</b>	Local Government Authority
<b>MER</b>	market exchange rates
<b>NBS</b>	National Bureau of Statistics
<b>PPP</b>	purchasing power parity
<b>SAM</b>	severe acute malnutrition
<b>SDG</b>	Sustainable Development Goal
<b>USD</b>	United States dollar



# INTRODUCTION







# INTRODUCTION

Over the past decade, conflict in north-eastern Nigeria has killed tens of thousands, destroyed infrastructure, displaced millions, and devastated economic, health, and education systems. Even before violence escalated, the region was developmentally vulnerable, facing high levels of poverty, inequality, unemployment, and land degradation. As a result, conflict has made the situation in north-eastern Nigeria «one of the most pronounced, multi-faceted and complex humanitarian and development crises known to the international community today.»<sup>1</sup>

The purpose of this report is to evaluate how the conflict has altered the region's development trajectory and to project its impact if it continues for another ten years. Considerable work has gone into understanding how the conflict has affected poverty, health, and education in the region. We build on this research by taking a dynamic and integrated approach to assessing the conflict's interacting effects and forecasting the impact of continued fighting.

We assess developmental impact within the context of the Sustainable Development Goals (SDGs) and Agenda 2030. A key tenet of Agenda 2030 is that no one is left behind,

which means that achieving any of the SDGs will require addressing the crisis in Nigeria's north-eastern region. This research explores the consequences of failing to make progress towards SDG 16, which aims to “promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.”<sup>2</sup> Sustained peace is not only important for achieving SDG 16 – it is a prerequisite for the entire SDG agenda. We find that protracted conflict in north-eastern Nigeria is responsible for destroying coping systems and stagnating development, all while racking up staggering fatalities.

This report begins with a brief overview of the origins of Boko Haram and the dynamics of the conflict since 2009. That is followed by a review of the existing literature on the impact on development of armed conflict in general and in Borno, Adamawa, and Yobe (the BAY states) in particular.<sup>3</sup> A methodology section outlines our techniques and core scenario assumptions. Finally, we explore our results with a focus on how conflict has impacted the lives of Nigerians and development in the region.



# CONFLICT BACKGROUND





# CONFLICT BACKGROUND

Boko Haram, officially named Jama'atu Ahlis Sunna Lidda'awati Wal-Jihad (JAS), or "People Committed to the Propagation of the Prophet's Teachings and Jihad," was founded in 2002 by Muhammed Yusuf, who established a mosque in Maiduguri.<sup>4</sup> In its earliest years, Boko Haram regularly launched small-scale attacks against the military and police as well as religious leaders critical of the group. Conflict truly escalated in 2009, when a traffic stop involving Boko Haram members ended in violent confrontation. This incident led to a five-day police crackdown that resulted in between 700 and 1,000 deaths and the assassination of Yusuf by Nigerian security forces. After the crackdown, many believed the group was defeated. Instead, it regrouped and reemerged in 2010 under the leadership of Abubakar Shekau.

Throughout the first half of the 2010s, the group expanded in territory, influence, and deadliness, combining the tactics of a terrorist group with guerilla warfare.<sup>5</sup> Under Shekau, the group expanded the scope of its grievances, increasingly targeted civilians, and used more sophisticated combat and propaganda tactics.<sup>6</sup> In 2013, the government declared a state of emergency in Borno, Adamawa, and Yobe states.<sup>7</sup> The deadliest years of the conflict to date were 2014 and 2015. Boko Haram was involved in events leading to nearly 8,000 fatalities in 2014 and nearly 9,000 in 2015, compared to an average of about 2,000 annually in the three years prior.<sup>8</sup> In 2014, Boko Haram was declared the deadliest terror group worldwide, surpassing Islamic State in Iraq and the

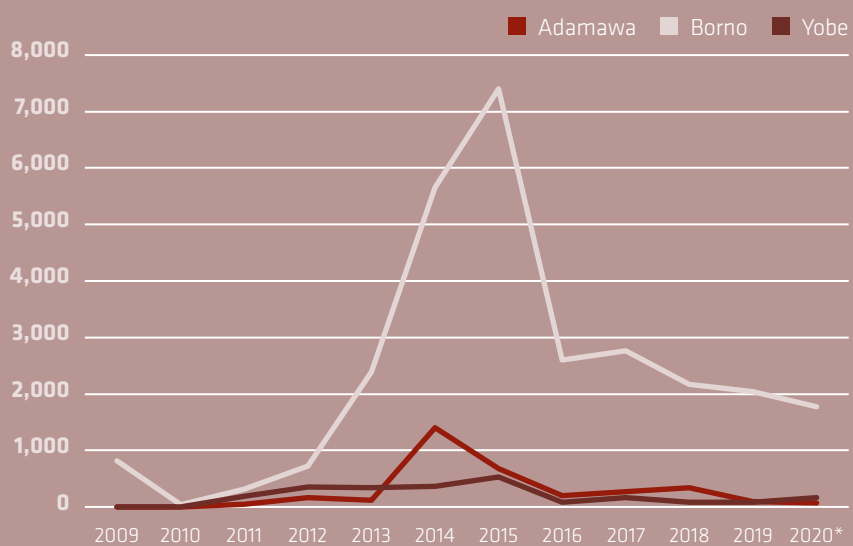
Levant.<sup>9</sup> The following year, the group pledged allegiance to Islamic State and became Islamic State's West Africa Province (ISWAP).

Beginning in 2015, Boko Haram started losing ground due to a stronger and more coordinated military response, greater international and regional support, and the spread of civilian joint task force groups.<sup>10</sup> The group lost considerable territory, fighters, and resources, and by late 2015 was largely pushed into north-eastern Borno.<sup>11</sup> By the end of 2015, Nigerian President Muhammadu Buhari had declared a "technical" defeat of Boko Haram.<sup>12</sup> Still, the group proved adaptable and resilient even though it has been considerably weakened since its peak. As Boko Haram lost territory within the country, its efforts were increasingly focused on Cameroon, Chad, and Niger. In 2016, nearly half of Boko Haram-related conflict activity occurred outside Nigeria.<sup>13</sup>

The group underwent an ideological split in 2016. Abu Mus'ab Al-Barnawi led the splinter group, which maintained contact with Islamic State and the ISWAP label, while Shekau's faction readopted the JAS name. The two groups coexist, with JAS based in southern Borno and ISWAP concentrated around Lake Chad. Though ISWAP was originally small and heavily reliant on Islamic State for support, over the past two years it has grown considerably in manpower, territory, and funding as it formed relationships with local communities, set up shadow governments, and established legitimacy.<sup>14</sup>



**Figure 2:** Annual direct conflict deaths in Adamawa, Borno, and Yobe states from 2009 to 2020



Source: Armed Conflict Location and Event Data Project (ACLED). \*Data for 2020 included through July 31.



# CONFLICT'S IMPACT ON DEVELOPMENT IN NORTH- EAST NIGERIA





# CONFLICT'S IMPACT ON DEVELOPMENT IN NORTH-EASTERN NIGERIA

Armed conflict damages societies in clear and striking ways, killing combatants and civilians and destroying critical infrastructure. Its effects are also felt indirectly, as economic production stalls, food, education, and health systems break down, income generation stagnates or disappears, and displacement forces people into crowded and unsanitary conditions. In many ways, conflict can be 'development in reverse.'<sup>15</sup>

To assess conflict's direct and indirect impact on society and development, we focus on three areas: demographics, economic development, and human capabilities. This assessment, however, is far from exhaustive. War has effects beyond these areas, such as eroding social capital, social infrastructure, and community cohesion<sup>16</sup> and causing damage to the environment.<sup>17</sup> We focus our literature review on those aspects of development that are most relevant to this analysis. The following sections review the literature on the effects of conflict on select areas of development, and how these effects have manifested themselves in the BAY states.

## Conflict and demographics

### Mortality

One of the most notable effects of a war is its death toll. Conflict events directly lead to the deaths of combatants and civilians, who make up the direct mortality. As of 31 July 2020, conflict has directly resulted in 34,457 deaths in Adamawa, Borno, and Yobe states since the beginning of 2009.<sup>18</sup>

Conflict can also increase mortality indirectly. For example, destroyed health infrastructure and degraded living conditions can lead to increased deaths from disease and hunger. To our knowledge, there have been no prior efforts to estimate the number of indirect deaths from

this conflict. However, many sources suggest that indirect mortality has been considerable, as evidenced by increased child mortality<sup>19</sup> and famine-related deaths.<sup>20</sup>

### Migration and displacement

Violence is the primary cause of forced migration globally.<sup>21</sup> In many cases, wars create more refugees (those who are forced to flee the country) than internally displaced people (IDPs).<sup>22</sup> Forced migration patterns are often determined by a complex web of factors, including policy, ease of movement, and economic considerations. Out of all refugees, 90 percent go to a neighboring country.<sup>23</sup> Often, forced migration can be prolonged or even permanent. Today, two thirds of refugees are in 'protracted situations' in which a large population of refugees have been in a given asylum country for at least five years.<sup>24</sup>

Boko Haram attacks have led to massive internal displacement. More than 1.8 million Nigerians are displaced in Adamawa, Borno, and Yobe states, with the vast majority (nearly 1.5 million) located in Borno.<sup>25</sup> In camps and host communities, IDPs often live in poor conditions and lack access to adequate food and services.<sup>26</sup> While some IDPs prefer to stay within Nigeria, others cite cost and a lack of a social network in destination countries as barriers to leaving.<sup>27</sup>

More than 280,000 Nigerians are registered as refugees in Cameroon, Chad, and Niger, with the majority having fled violence in Nigeria's north-east.<sup>28</sup> Conditions for refugees in these bordering countries are often worse than those of IDPs.<sup>29</sup>

While many of the displaced would like to return home, insecurity remains a major barrier. In fact, many of the displaced have been displaced more than once.<sup>30</sup> The return

of over 1.6 million IDPs and refugees has been recorded. However, many are returning to damaged homes and have no access to education, health services, or nearby markets.<sup>31</sup>

## **Conflict and economic development**

### **Economic production**

Conflict can severely disrupt economic activity through the destruction of productive assets, diversion of resources, death and injury to the population, and damage to health and education systems. Many studies have found that political instability and conflict have a dampening effect on economic growth.<sup>32</sup>

In north-eastern Nigeria, conflict has further damaged an economy that was already strained by inequality,<sup>33</sup> low agricultural productivity,<sup>34</sup> and high unemployment,<sup>35</sup> especially among youth.<sup>36</sup> Agricultural production, the dominant economic sector in the region, has been severely cut (see below). Buildings and transportation infrastructure have been destroyed, while road closures and military bans have impeded the movement and sale of certain goods.<sup>37</sup> Many businesses are fully or partially closed,<sup>38</sup> investment is reduced,<sup>39</sup> and market activity is suppressed.<sup>40</sup> A World Bank assessment estimated cumulative GDP losses from 2011 to 2015 at \$6.21 billion (\$3.54 billion in Borno, \$1.57 billion in Adamawa, and \$1.1 billion in Yobe).<sup>41</sup>

### **Agricultural production**

Conflict reduces agricultural production<sup>42</sup> and productivity.<sup>43</sup> Land is often abandoned by agricultural workers who are killed or displaced<sup>44</sup> and those who stay may shift to lower-risk crops or cut back investment.<sup>45</sup> Conflict also makes it harder to do business as farmers deal with labor shortages,<sup>46</sup> rising prices of farming inputs,<sup>47</sup> and disruptions throughout the agricultural value chain.<sup>48</sup>

Agriculture is the main economic activity in north-eastern Nigeria, employing between 65 and 80 percent of the populations of Adamawa, Borno, and Yobe and contributing over half of regional GDP.<sup>49</sup> Conflict over the past decade has only exacerbated a situation characterized by environmental degradation, low productivity, and high sensitivity to climatic factors.

Boko Haram activity has been associated with reductions in crop production and productivity<sup>50</sup> as well as declines in hired agricultural labor and wages.<sup>51</sup> Frequent attacks on markets have led to closures and reduced market activity across the region<sup>52</sup> as well as reduced trade in agriculture.<sup>53</sup> Mass displacement has led to land abandonment and holdings left fallow.<sup>54</sup> Many farmers are unable to invest in agriculture and lack access to land, assets, capital, and key inputs.<sup>55</sup> In some areas, farmers face restrictions limiting the types of crops that can be planted and how far they can travel for farming activities.<sup>56</sup>

### **Infrastructure**

Along with human casualties, the destruction of infrastructure is one of the most visible effects of violent conflict. Critical infrastructure may be targeted and attacked for strategic reasons.<sup>57</sup> Damage to infrastructure affects various aspects of economic and human development by raising the cost of production, delaying movement of goods and aid, and, in the case of water and sanitation infrastructure, fomenting the spread of communicable diseases.<sup>58</sup> Conflict also diverts investment and increases the cost of new infrastructure developments.<sup>59</sup>

Infrastructure in north-eastern Nigeria has been historically underdeveloped, due to both poor economic growth and low levels of investment.<sup>60</sup> In 2008, just three percent of the population had access to safe sanitation and 30 percent to electricity, while 90 percent reported difficulty accessing water.<sup>61</sup> Since 2009, conflict has both damaged existing infrastructure and disrupted new development.

Conflict has also damaged houses, roads, bridges, schools, health facilities, and public buildings.<sup>62</sup> Electricity, energy, and telecommunications networks have been destroyed or damaged.<sup>63</sup> Construction work was halted while investment stalled,<sup>64</sup> putting planned improvements on hold. An estimated 75 percent of all water and sanitation infrastructure was destroyed.<sup>65</sup> A World Bank assessment estimated the cost of conflict's damage to infrastructure and social services across north-eastern Nigeria at nearly \$9 billion (\$6.9 billion in Borno, \$1.2 billion in Yobe, and



\$829 million in Adamawa).<sup>66</sup> Though reconstruction has already begun in some areas, progress has been uneven.<sup>67</sup>

## Conflict and human capabilities

### Poverty

Since conflict curbs economic growth, it often leads to heightened levels of poverty. Collier calculates that the reduction in economic growth after seven years of conflict lowers income by 15 percent and increases the poverty rate by 30 percent.<sup>68</sup>

Poverty has been pervasive and growing in north-eastern Nigeria for decades.<sup>69</sup> In fact, growing poverty and deprivation are often cited as drivers of the Boko Haram insurgency.<sup>70</sup> All evidence suggests that conflict has only further impoverished the population. Many have lost their income and livelihoods due to displacement, cuts in agricultural production and trade, and economic destruction described above, leaving them vulnerable and reliant on humanitarian assistance. Addressing terrorism and conflict has also drawn government resources away from poverty alleviation.<sup>71</sup> Boko Haram activity has been associated with an increase in the incidence, intensity, and severity of poverty in Nigeria.<sup>72</sup> As of 2019, 81 percent of people living in Yobe, 64 percent in Borno, and 60 percent in Adamawa suffer from multidimensional poverty, a measure that accounts for deprivation with respect to standards of living, health, and education.<sup>73</sup>

### Health and morbidity

By destroying crucial health infrastructure and degrading living conditions for the population, war leads to significant decline in the parameters of a healthy life, especially among children.<sup>74</sup> Conflict results in reduced access to health services<sup>75</sup> and often disrupts prevention and treatment programs.<sup>76</sup> Systems of food production and distribution are often disrupted at the same time as families' livelihoods are destroyed and incomes reduced, resulting in food insecurity, malnutrition, and even famine.<sup>77</sup>

In north-eastern Nigeria, physical and economic destruction wrought by the insurgency has dismantled

already fragile health and food systems. Less than 60 percent of health facilities in Adamawa, Borno, and Yobe states are fully functional, while a quarter are either completely destroyed or non-functional.<sup>78</sup> Access is further reduced due to shortages in skilled health personnel, a lack of adequate medicine and supplies, and the high cost of treatment.<sup>79</sup> Displaced populations are at heightened risk due to overcrowding and unsanitary living conditions.<sup>80</sup>

The conflict has also led to a food crisis.<sup>81</sup> Over 920,000 children in Borno, Adamawa, and Yobe are estimated to have global acute malnutrition (GAM), while over 288,000 have severe acute malnutrition (SAM).<sup>82</sup> Insecurity has also rendered 85 percent of Borno territory inaccessible to humanitarian agencies, constraining the ability to provide aid.<sup>83</sup> The FAO estimated that in the lean season (June through August) of 2020, 3.6 million people in the BAY states would be severely food insecure, a nearly 20 percent increase from the 2019 season.<sup>84</sup>

The conflict in north-eastern Nigeria has been associated with numerous adverse health outcomes. Boko Haram activity has been associated with higher rates of child mortality,<sup>85</sup> undernutrition and wasting of children,<sup>86</sup> lower vaccination rates,<sup>87</sup> reduced access to maternal healthcare,<sup>88</sup> and psychological trauma.<sup>89</sup> Insecurity slowed polio eradication efforts<sup>90</sup> and has likely worsened the HIV/AIDS situation.<sup>91, 92</sup>

### Education

War often leads to the destruction and closure of schools, making it difficult or impossible for children to attend. As families flee the war, displaced children often lack access to education.<sup>93</sup> Even children who have not been displaced may stop attending school due to the risk of abduction,<sup>94</sup> to help the household survive a shock,<sup>95</sup> or due to fear of attack or violence when leaving the house.<sup>96</sup> While some conflicts result in significant reductions in the population's education, the evidence is broadly mixed,<sup>97</sup> and education effects may be most visible at the local level even while national trends continue to improve.<sup>98</sup>

The education system in north-eastern Nigeria was strained even prior to the escalation of conflict. Over half of children in the North-East Zone were out of school in 2008, including 32.9 percent of children in Adamawa, 63.5 percent in Yobe, and 73.4 percent in Borno.<sup>99</sup> Education has been an important target of direct attack by Boko Haram, a group whose name is frequently translated as “Western education is forbidden.” Between 2014 and early 2017, Boko Haram destroyed roughly 1,500 schools while claiming over 1,200 students and teachers as casualties.<sup>100</sup> Over 1,000 children have been abducted since 2013,<sup>101</sup> including the 2014 abduction of 276 girls from a school in Chibok and another incident six months later, when more than 300 children were abducted from a primary school in Damasak.<sup>102</sup> Direct attacks on education peaked between 2013 and 2015 but have slowed in recent years.<sup>103</sup>

Education has also been disrupted due to school closures and takeovers<sup>104</sup> as well as the displacement of students and teachers.<sup>105</sup> Many schools remain closed or have experienced disruptions, while students who can enroll often lack access to sufficient learning materials and many teachers lack the minimum teaching qualifications, according to the Education in Emergencies Working Group in Nigeria.<sup>106</sup> Bertoni et al.<sup>107</sup> find that proximity to conflict in the region lowers school enrolment in nearby villages and the average educational attainment of the population.

### Conflict and gender

Conflict in north-eastern Nigeria has affected men and women in different ways and worsened pre-existing gender inequalities. Men make up the majority of direct conflict deaths<sup>108</sup> and have been subjected to abduction and forced recruitment by Boko Haram<sup>109</sup> as well as mass arrests, human rights abuses, and extrajudicial killings.<sup>110</sup> Women and children make up 80 percent of the displaced

population.<sup>111</sup> Displaced women have limited options for work and survival,<sup>112</sup> and have difficulties accessing resources.<sup>113</sup> Widows often struggle to retain access to property and savings that may be claimed by a deceased husband’s relatives.<sup>114</sup>

Women especially have been targets of abduction by Boko Haram. An estimated 500 women were abducted between 2009 and 2014.<sup>115</sup> Abducted women have been subjected to violence and abuse and used as spies, fighters, and suicide bombers.<sup>116</sup> Women who have escaped or been released are not always welcomed back to their communities<sup>117</sup> and those returning from captivity or involvement with armed groups do not have access to the training, counseling, and reintegration programs that target men.<sup>118</sup>

Violence against women is widespread<sup>119</sup> but often goes officially unreported.<sup>120</sup> Early marriage has been reported,<sup>121</sup> not only as a result of abduction but also as a measure of protection for local girls<sup>122</sup> and as an economic coping mechanism.<sup>123</sup> Boko Haram activity has been associated with reduced access to, and utilization of, maternal health care<sup>124</sup> and has slowed progress towards eliminating intimate partner violence.<sup>125</sup>

The conflict’s gendered impact on education is not yet clear. Teachers surveyed have reported a reduction in girls’ attendance due to fear of attack and abduction.<sup>126</sup> But Bertoni et al.<sup>127</sup> find nearby Boko Haram activity to be associated with a greater reduction in overall education attainment for boys rather than for girls. This could be due to a greater impact on the educational enrolment of boys, but it could also be due to the loss of educated men in the community or because men’s educational attainment started from a higher base.



# METHODOLOGY







# METHODOLOGY

## International Futures

We used the International Futures (IFs) tool to quantitatively assess the impact of conflict on development for this report. IFs is an open source integrated assessment modeling platform that allows for historical data and scenario analysis of 186 countries. IFs encompasses integrated relationships across 12 core systems: agriculture, demographics, economics, education, energy, environment, finance, governance, health, infrastructure, international politics, and technology. All the systems and modules within IFs are connected dynamically, so that changes in one system lead to changes across all others. IFs has been used to measure and forecast development potential across Africa and the globe, and to estimate conflict's impact in Yemen (see Hughes<sup>128</sup> for a more complete overview of the tool).

To measure the impact of conflict on the BAY states, we built a sub-national model for Nigeria, rebased the model to a pre-conflict year, and constructed scenarios simulating development with and without conflict. Each of these steps is explained in more detail in the following sections.

## Building a sub-national Nigeria model

IFs is most often used at the country, regional, and global levels, but can be modified to represent development at “sub-national” units within countries, such as states or provinces. Modeling a regional conflict in Nigeria at the national level would miss key local development dynamics and would make the effects of the conflict difficult to ascertain. For this project, we modified IFs to allow for sub-national forecasts of development across 37 geographical units (36 states and one capital territory), enabling sub-national projections for Adamawa, Borno, and Yobe.

The most challenging aspect of sub-national modeling with IFs is locating sufficient data to initialize the model. At the outset of this project, we extensively searched for

appropriate state-level figures for the most important core development indicators, focusing on those that are important for IFs and those that are especially relevant to assessing human development in a conflict setting. We reviewed sources from the Nigerian government, international and national organizations, academic researchers, and large-scale surveys. We also reviewed and incorporated satellite-based estimates and consulted with a contact at Nigeria's National Bureau of Statistics (NBS).

Data from all sources were examined carefully to determine whether they were suitable for use in this project. In order for the data to be sufficient for use in IFs, the following criteria needed to be met:

- the source variable definitions matched those needed for import into the model;
- data coverage and quality were adequate;
- coverage was available or could be extended to pre-conflict years;
- coverage was available for Adamawa, Borno, and Yobe; and
- the data were not drastically inconsistent with our national-level sources and other series.

To ensure consistency, all state-level series were normalized using figures from the standard international sources more typically used in IFs. A full list of the data series imported into IFs for this project is available in Appendix A.

## Modeling conflict in IFs

With a working sub-national model rebased to 2008, the final step was to construct two scenarios:

- The **No Conflict** scenario is a counterfactual one that simulates how the BAY states may have developed in the absence of protracted conflict and insurgency. In

this scenario, IFs largely works endogenously to project an optimistic but reasonable development trajectory for the region, taking into account pre-existing development challenges.

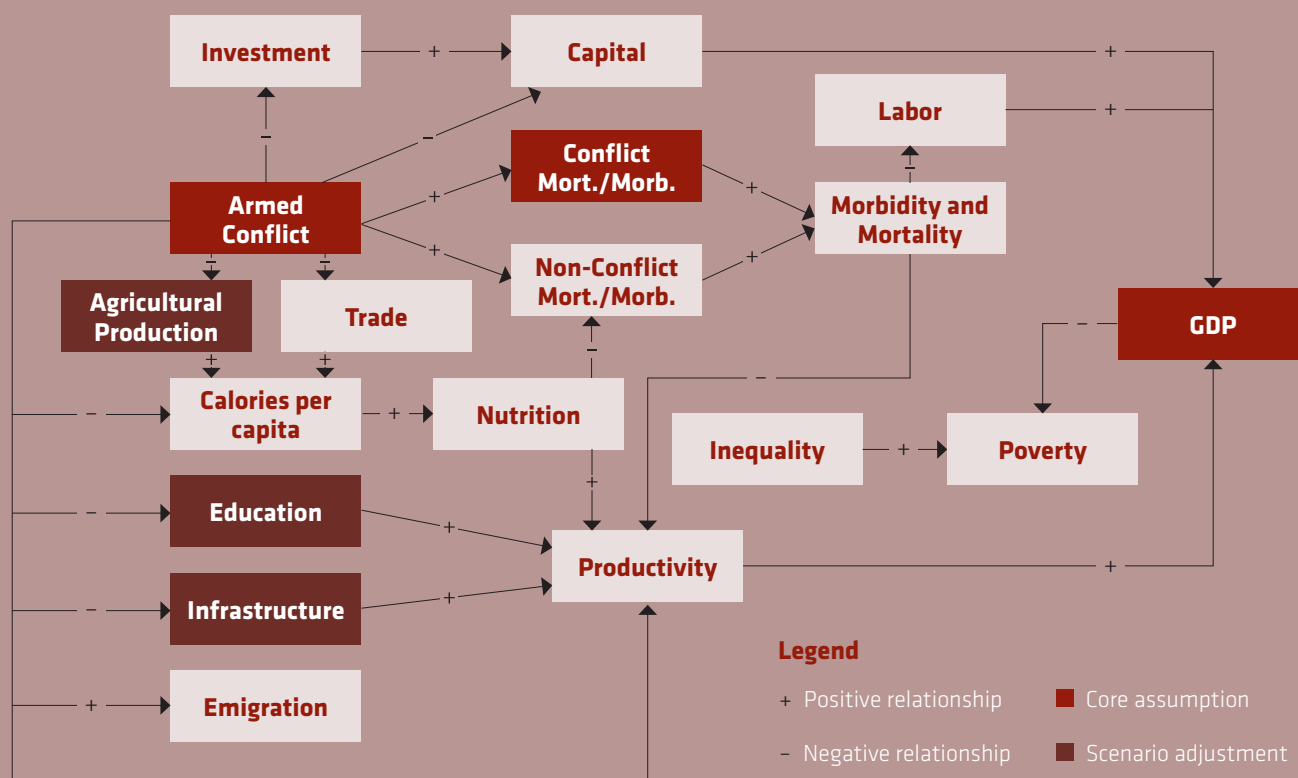
- The **Conflict** scenario reflects how development has unfolded in the BAY states over the past decades under conflict conditions. We incorporate key assumptions from the available data and literature into the IFs model, which then allows us to fill in variables for which good data do not exist.

Because IFs was not developed to reflect the patterns and development context of a specific region in conflict, we adjusted the Conflict scenario to reflect our best understanding of the situation in north-eastern Nigeria. This involved several adjustments. First, we incorporated as core assumptions variables measuring the largest and most direct effects of conflict: direct conflict deaths, the magnitude of conflict, and GDP growth rates. We then explored the impact of adding these assumptions

to the model on other indicators. We identified a set of indicators that were highly relevant for the conflict in north-eastern Nigeria and for which we had data or literature assessments that we could use for comparison. We compared the resulting figures from IFs with estimates made by others and, where necessary, adjusted the parameterization of the model. Figure 2 shows the conceptual framework used for this exercise. The boxes in orange represent core assumptions and those in blue represent indicators we adjusted based on the estimates of others. A more detailed description of this process and a list of the adjustments made can be found in Appendix B.

This methodology allows us to make reasonable estimations where data are not available by providing a strong, evidence-backed conceptual framework and information on other variables within that system. This is especially valuable in a conflict environment where high quality and representative data are difficult to come by.

**Figure 3:** Conceptual model framework used in this project and within the International Futures platform





Through a counterfactual scenario analysis, we can better understand the impact of the conflict itself, independent of a region's pre-existing challenges. Moreover, we can dynamically forecast the effects of a conflict, taking population and developmental context into consideration.

But there are important limitations inherent in this methodology. For one, data and modeling limitations prevent us from unpacking certain important aspects of development, such as the environmental effects and differential impact by gender. Second, this report is narrowly focused on understanding the specific effects of a specific conflict scenario. We do not explore the causes

of the conflict, nor do we make any attempt to forecast prospects for recovery. Because the Conflict scenario is constructed to accord with the reported situation, it assumes no major and transformative changes to conflict dynamics, which are volatile and liable to change rapidly, nor to ongoing development and humanitarian responses.

With this in mind, this modeling exercise should not be seen as a prediction of north-eastern Nigeria's future. Rather, it is meant to help policymakers and advocates for peace better understand the implications of continued conflict in terms of the lives lost and missed opportunities to sustainably improve human development.<sup>129</sup>

### Accounting for COVID-19 in north-eastern Nigeria

The COVID-19 pandemic has drastically changed development trajectories for countries across the world. As of 31 July 2020, Nigeria had over 42,600 confirmed cases of COVID-19 and over 800 deaths.<sup>129</sup> The outbreak and subsequent containment measures have hit the country severely as oil prices have fallen, supply chains have been disrupted, the Naira has depreciated, and lockdowns have affected the economic centres of the country.<sup>130</sup>

Only a fraction of Nigeria's recorded cases occurred in the north-eastern region. As of 1 August, Borno had 613 confirmed cases (35 deaths), Adamawa had 164 confirmed cases (nine deaths) and Yobe had 67 confirmed cases (eight deaths).<sup>131</sup> Cases are heavily concentrated in urban areas. More than 90 percent of cases in Borno were reported in the capital of Maiduguri and neighboring LGA Jere.<sup>132</sup> Relatively low case numbers compared to the country overall could be due to a less mobile and more rural population, but they are also likely the result of a lack of testing and thus significantly underestimate the presence of the virus. There remains a high risk of greater spread and outbreak, especially in urban areas and among the displaced. IDP camps across Borno are congested and considered a high risk for disease spread due to lack of space and limited access to water and sanitation.<sup>133</sup>

These states are especially vulnerable to the economic consequences of the pandemic. Many Nigerians have little food or income saved and are reliant on daily income and the informal sector.<sup>134</sup> Policies like lockdowns and mobility restrictions not only limit the ability of people to work and obtain food, but they also interfere with informal social networks that act as safety nets for vulnerable populations.<sup>135</sup> North-eastern Nigeria is at increased risk of suffering a food crisis as a result of the pandemic.<sup>136</sup> Supply chain disruptions and lockdowns are likely to slow down the provision of humanitarian relief.<sup>137</sup>

There is still a great degree of uncertainty on how and to what degree COVID-19 will affect the region in both the short and long term. The pandemic's effects are interacting with, and often exacerbating damage done by, a history of underdevelopment and more than a decade of protracted conflict. It is hitting vulnerable groups, like women and people with disabilities, the hardest, and exacerbating pre-existing gender inequality.<sup>138</sup> The specific ways these crises will interact are still too uncertain to be incorporated into the IFs model at this point. However, we do alter growth trajectories in accordance with the International Monetary Fund's recent update to their country growth projections.<sup>139</sup> For both scenarios, we have lowered growth assumptions for Adamawa, Borno, and Yobe based on the IMF's revisions to growth in Nigeria.





# RESULTS







# RESULTS

## No Conflict

Before comparing the scenarios and assessing the effects of the conflict, we will first explore the *No Conflict* scenario on its own. A simulation of what might have happened in north-eastern Nigeria in the absence of conflict, the *No Conflict* scenario offers a glimpse of a possible future of peace and steady progress in the region. It assumes that standard developmental dynamics continue from 2008 in the absence of conflict. This scenario does not account for future and unforeseen events, nor does it assume transformational positive policy change as a result of new development and aid programs in the region.

Even prior to 2009, north-eastern Nigeria faced slow growth<sup>140</sup> and considerable development challenges. Nationally, poverty and inequality had been rising for decades<sup>141</sup> and by 2010, nearly 70 percent of Nigerians in the North-East Zone lived on less than a dollar per day.<sup>142</sup> The regional economy was centered around agriculture, though productivity was low as a result of a number of factors including poverty, lack of access to key inputs like fertilizer, inability to invest in high productivity technologies, and steady land degradation.<sup>143</sup> Unemployment was high, especially among women, youth, and rural populations.<sup>144</sup> Food insecurity was widespread and pronounced,<sup>145</sup> and infant and child mortality rates were among the highest in the country.<sup>146</sup>

Educational attainment was also low. A longstanding gap in education exists between northern and southern Nigeria as a result of colonial educational policies<sup>147</sup> and a preference for informal religious education, which state governments have been unsuccessful in integrating with secular education.<sup>148</sup>

In the *No Conflict* scenario, these challenges do not disappear. But north-eastern Nigeria can develop and

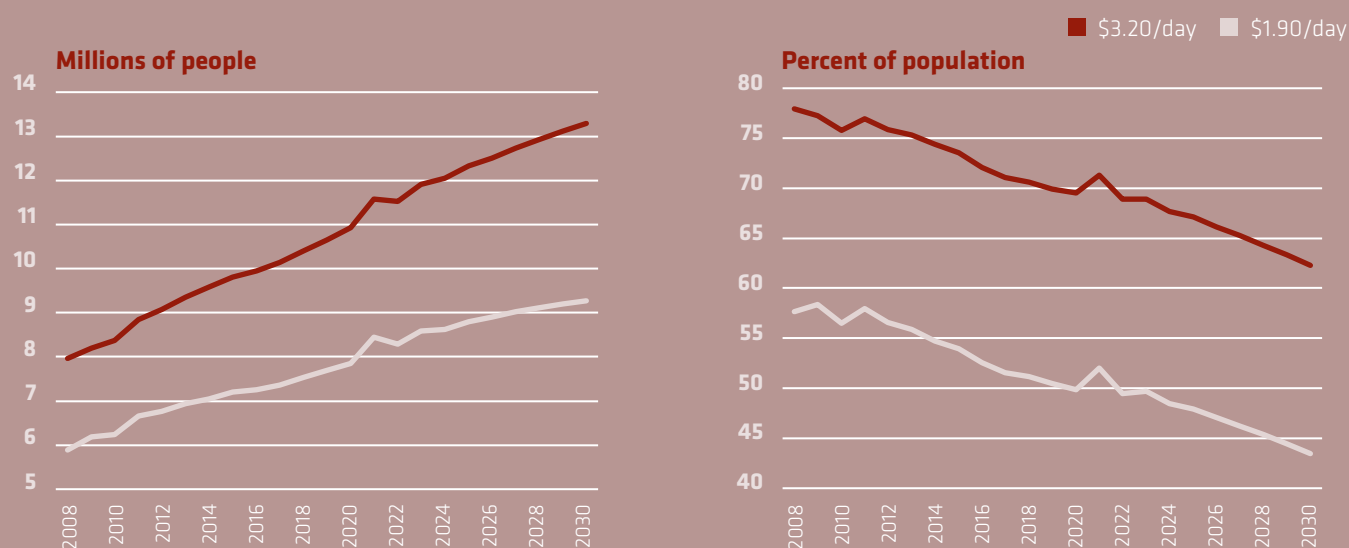
progress in a time of peace. GDP growth in the region averages 4.5 percent through 2019. We expect growth in GDP per capita would likely still have stagnated early on, averaging roughly one percent through 2019, reflecting a trend of slower growth nationwide and in many other states. Moreover, the entire country would still be affected by the COVID-19 pandemic in 2020. But even with these setbacks, we project that a north-eastern Nigeria without conflict would have a GDP per capita of nearly \$3,400 by 2030, an improvement of more than 40 percent from 2008.

This growth is expected to alleviate poverty, but continued population growth means that, even in this scenario, more people would be living in poverty by 2030 than today. However, the proportion of people living in poverty begins to decline. From 2008 to 2030, the rates of poverty and extreme poverty fall by 20 and 25 percent, respectively.

Between 2008 and 2030, an additional 4.4 million Nigerians in the region gain access to improved sanitation and 3.9 million to piped water. With growing incomes and improved access to water and sanitation come improvements to population health. Infant mortality falls by 40 percent and life expectancy improves by a decade.

Of course, none of these improvements are sufficient to achieve the SDGs. It would take more than the absence of conflict to overcome the immense obstacles in the region. The *No Conflict* scenario serves as a realistic and reasonable vision for the region, considering historical trends and pre-existing challenges. The SDG agenda requires transformative progress, targeted policies, innovation, and good governance. This is nearly impossible to achieve during protracted conflict. The *No Conflict* scenario simulates a north-eastern Nigeria where peace and slow improvements offer not a guarantee of prosperity

**Figure 4:** Poverty indicators in the No Conflict scenario



Source: IFs 7.52 Nigeria sub-national.

but the opportunity to make lasting and transformational improvements in the lives of Nigerians. That is the backdrop against which we assess the damage of more than a decade of destruction and fighting.

### Effect of conflict

In this section, we turn to the Conflict scenario. Combining literature and data from the region with our best understanding of development relationships allows us to simulate the impact of conflict on development in the model. This allows us first to fill in information gaps due to a lack of high quality, representative data, and to paint a fuller picture of development in the region. Second, it allows us to see the indirect effects of the conflict. See Table 2 for results for key development indicators.

One of the most striking indirect conflict effects is the indirect death toll. The conflict is killing many more people than just combatants and direct victims of violence.

Indirect deaths, which include deaths from disease and hunger resulting from the conflict's physical and economic destruction, already far outnumber those from direct causes. Figure 5 shows the annual total 'conflict-attributable' deaths. The conflict-attributable value is the difference between the value of an indicator in the *Conflict* scenario and its value in the *No Conflict* scenario. In this case, conflict-attributable deaths represent deaths that do not occur in the *No Conflict* scenario. We estimate that the indirect death count will amount to more than 313,000 by the end of 2020. If the conflict persists for another ten years, that impact continues to grow. Cumulative conflict-attributable deaths reach 722,000 by 2025 and nearly 1.2 million by 2030. This growing impact is the result of the growing development disparity between the Conflict and No Conflict scenarios as well as an expanding population in the region.

**Table 2:** Human development indicators for north-eastern Nigeria by scenario.

	2008	No Conflict			Conflict			Conflict-attributable difference		
		2020	2025	2030	2020	2025	2030	2020	2025	2030
<b>GDP</b> MER, billion USD	11.9	18.1	24.9	36.1	13.0	15.7	19.8	5.1	9.2	16.3
<b>GDP per capita</b> PPP, thousand USD	2.4	2.4	2.9	3.4	2.0	2.1	2.3	0.44	0.75	1.1
<b>Poverty headcount</b> million people	5.9	7.8	8.8	9.3	9.2	10.7	12.0	1.4	1.9	2.7
<b>Poverty</b> percent of population	57.6	49.9	47.9	43.5	59.5	59.1	56.4	9.6	11.2	12.9
<b>Malnourished children</b> million children	0.56	0.76	0.75	0.76	1.31	1.31	1.37	0.55	0.62	0.62
<b>Malnourished children</b> percent of children	31.7	27.5	24.9	22.2	49.0	44.5	37.4	21.5	19.6	15.2
<b>Infant mortality rate</b> deaths per 1,000 live births	96.9	80.7	69.5	58.7	122.5	111.1	97.9	41.8	41.6	39.2
<b>Water unimproved</b> million people	3.6	4.9	5.5	6.0	7.3	8.4	9.7	2.3	2.9	3.7
<b>Sanitation other unimproved</b> million people	7.2	9.8	11.0	11.9	12.0	13.9	15.8	2.2	2.9	3.9
<b>Missing students primary</b> million children	1.4	1.7	1.7	1.6	2.9	3.5	3.9	1.2	1.8	2.3
<b>Missing students secondary</b> million children	1.5	1.4	1.7	1.7	2.0	2.6	2.5	0.6	0.9	0.8
<b>Education years</b> average, population 15+	4.7	5.3	5.5	5.8	5.0	4.9	4.8	0.3	0.7	1.0

Sources: HDI 2012 and 2014 national.



The indirect death toll is felt overwhelmingly by children. Young children are especially vulnerable to malnutrition, more vulnerable to disease when malnourished, and more likely to die. They are hit especially hard by conflict's effects on the economy, on agricultural production and trade, and on access to water and sanitation. In north-eastern Nigeria, conflict has caused spikes in child malnutrition as well as infant and child mortality and, for every year that the conflict continues, the toll on children grows. We estimate that 324,000, or more than 90 percent of conflict-attributable deaths through 2020, are of children younger than five. With another decade of conflict, that could grow to more than 1.1 million.

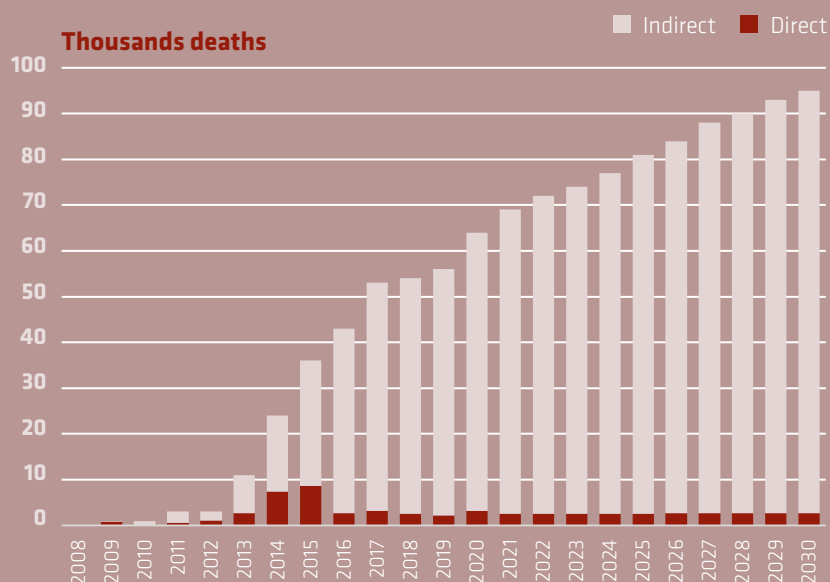
While these indirect effects have immediate consequences, they are also setting back progress and development more broadly. Conflict has stalled economic progress. Our GDP estimations show that GDP growth averaged less than half of one percent annually from 2010-2019. By comparing that to GDP in our No Conflict scenario, we can calculate

the 'conflict-attributable' effect on GDP. Through 2020, we find that the conflict has resulted in a total cumulative GDP loss of \$27.8 billion (See Figure 6). This measure allows us to account for absolute losses from pre-conflict levels as well as lost potential and forgone development. In the Conflict scenario, the losses continue to grow as the conflict-attributable difference in GDP widens, resulting in cumulative GDP loss of more than \$130 billion by 2030, roughly ten times the region's GDP today.

Other human development indicators show a similar pattern. The portion of people living in extreme poverty fluctuates between 55 and 60 percent throughout the Conflict scenario, while the No Conflict scenario projects a slow but steady reduction. Life expectancy in the Conflict scenario drops by two full years in 2014 and 2015. It begins to improve again after 2020, given moderate conflict conditions, but remains over six years lower than in the No Conflict scenario by 2030.



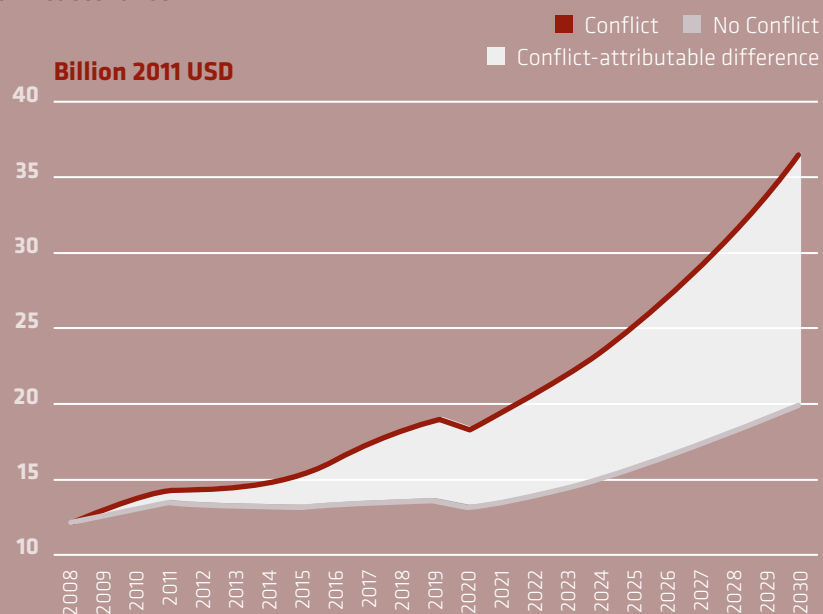
**Figure 5:** Annual direct and indirect conflict-attributable deaths in the BAY states through 2030



Source: IFs 7.52 Nigeria sub-national.

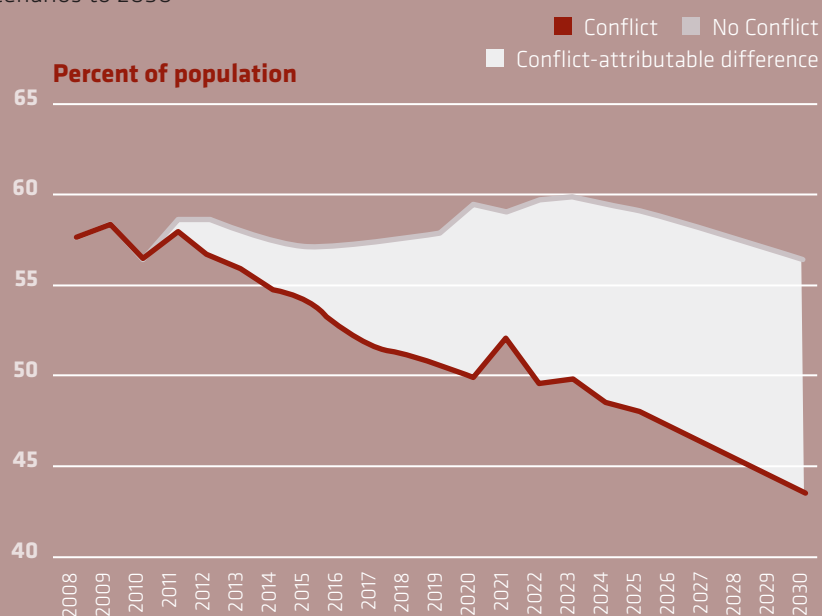


**Figure 6:** GDP at MER (2011 USD) for the BAY states in the Conflict and No Conflict scenarios



Source: IFs 7.52 Nigeria sub-national.

**Figure 7:** Select development indicators in the Conflict and No Conflict scenarios to 2030



Source: IFs 7.52 Nigeria sub-national.



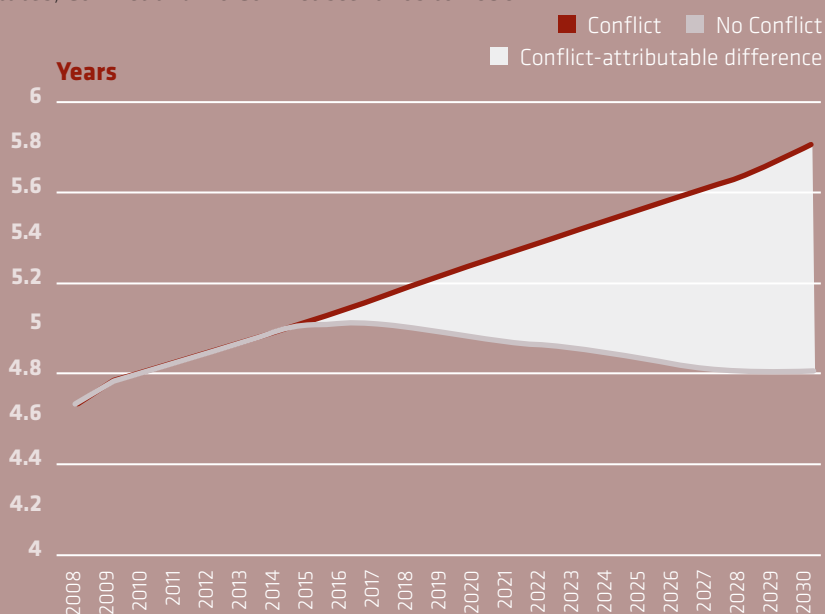
The educational consequences of this conflict are significant and will be long-lasting. Direct attacks on education as well as displacement and general insecurity have reduced enrolment at all levels. We estimate that the conflict has resulted in an additional 1.8 million students out of school in 2020, a figure which grows to over 3.1 million by 2030. Educational attainment in the region prior to 2009 was low but projected to make steady improvement. The conflict has halted progress and set back education in the region, thus setting back human development and capital. One way to measure overall education and human capital in a population is through average adult educational attainment. Because this figure accounts for the entire adult population, many of which are far removed from school, it changes very slowly. We find

that reductions in enrolment resulting from the conflict reduce the overall education years of the population. By 2030, the conflict-attributable reduction in education reaches a full year, a loss which, if the No Conflict scenario is any indication, could take two decades to recover from.

Even in a *No Conflict* scenario, north-eastern Nigeria is not likely to have achieved any SDGs. Table 3 shows values for select SDG indicators available in IFs in both scenarios. While many indicators would have improved, the region's pre-conflict development conditions and trajectory showed that slow progress was likely, but that the region would be far from achieving SDG targets. However, armed conflict has stalled progress, putting the region at an even greater disadvantage than before.



**Figure 8:** Average years of education for the 15+ population in the BAY states, Conflict and No Conflict scenarios to 2030



Source: IFs 752 Nigeria sub-national.



**Table 3:** Select SDG and SDG-related indicators for north-eastern Nigeria by scenario

Goal	Indicator	2008	No Conflict		Conflict	
			2020	2030	2020	2030
1	Percentage of population below \$1.90 (2011\$ PPP) per day; Lognormal	57.6	49.9	43.5	59.5	56.4
	Percentage of population below \$3.20 (2011\$ PPP) per day; Lognormal	77.9	70.3	62.4	78.2	75.2
2	Percentage of malnutrition (weight for height <-2 SD) among children under 5	31.7	27.5	22.2	48.9	37.4
	Severe acute malnutrition (weight for height <-3 SD) among children under 5	7.7	6.6	5.7	15.1	13.8
3	Infant mortality rate in deaths per thousand newborns	96.9	80.7	58.7	122.5	97.9
4	Primary education net enrolment rate	37.8	52.2	63.5	30.6	35.6
	Primary education gross completion rate	64.0	74.1	85.4	47.2	58.0
	Lower secondary education gross enrolment rate	38.8	57.4	67.8	34.6	41.4
	Lower secondary education graduation rate	36.3	40.1	45.8	34.5	38.2
	Upper secondary education gross enrolment rate	31.7	44.3	49.0	22.2	20.9
	Upper secondary education graduation rate	30.5	31.8	36.9	21.9	18.7
6	Percentage of people with access to improved water	64.7	68.8	71.8	53.4	54.5
	Percentage of people with access to sanitation services	10.8	18.3	25.9	8.4	12.0
7	Percentage of population with access to electricity	55.6	58.0	64.6	57.7	54.2
8	Annual growth rate of real GDP per capita	4.0	-6.5	3.5	-4.7	1.5
9	Manufacturing value added as a % of GDP	12.3	15.0	22.6	12.5	20.1
	Manufacturing value added per capita	0.14	0.17	0.38	0.11	0.19
	Connections per hundred people to fixed broadband technology	1.0	5.8	14.1	5.2	12.2
	Connections per hundred people to mobile broadband technology	0.001	97.9	125.3	93.9	118.5
11	Urban population weighted PM2.5 levels in residential areas of cities with more than 100k residents	41.6	33.6	29.7	32.1	28.9
16	Number of victims of intentional injuries per thousand	0.08	0.05	0.04	0.14	0.10

Source: IFs 7.52 Nigeria sub-national.



# CONCLUSION





# CONCLUSION

Conflict in north-eastern Nigeria has already claimed hundreds of thousands of lives and caused immense damage to the region's economy and development. Through the displacement of millions, destruction of infrastructure, and disruption of economic activity, the conflict's true death toll already far outnumbers any casualty count due to violence. Even if the fighting never again reaches the scope and intensity of 2014 and 2015, a protracted simmering conflict is enough to stall progress and development.

A scenario in which conflict continues through 2030 is one where progress is stalled for another ten years. More than half of the population will remain in extreme poverty – 2.7 million more people than projected in the absence of conflict. Over 1.1 million children will die unnecessarily and nearly 40 percent of children under five will suffer from malnutrition. Armed conflict will lead to a loss of \$150 billion in economic activity, setting the region back for decades to come.

This project explores the consequences of failing to make progress towards SDG 16, which focuses on eliminating violence and abuse, tackling corruption, and building

strong, accountable, and participatory institutions. The *Conflict* scenario fails to meet SDG target 16.1.2: conflict-related deaths per 100,000 population, while the *No Conflict* counterfactual scenario eliminates conflict-related deaths. Many targets, both within SDG 16 and throughout the SDG agenda, are unlikely to be met without first putting an end to conflict. But simply ending conflict conditions will not be enough, as a challenged region has already experienced lasting damage. There is still a lot of work to be done to strengthen institutions and build trust, to improve transparency and accountability, and to address non-conflict-related violence and abuse. “There can be no sustainable development without peace and no peace without sustainable development.”<sup>149</sup>

The 2030 Agenda is a pledge not just to improve conditions in the aggregate, but to “reach the furthest behind first.”<sup>150</sup> After generations of underdevelopment and more than a decade of conflict, north-eastern Nigerians are already among the furthest behind in the country. Continued conflict will not only set the region back in terms of development and progress toward the SDGs, but it will also leave an enduring scar on the population and development of the region.







# **APPENDIX A: DATA ESTIMATIONS AND NOTES**







# APPENDIX A: DATA ESTIMATIONS AND NOTES

This project required an immense effort to evaluate and incorporate data. To construct a sub-national version of IFs, we needed sufficient data coverage at the state level going back as far as possible.

This project involved rebasing the model to 2008. Beginning the model in 2008 instead of 2015 (the initialization year of the current IFs model) was a crucial step in the counterfactual analysis. This allowed IFs to simulate a counterfactual scenario, a reasonable development trajectory starting from 2008 in which the region would be spared the damage of conflict. Rebasing the model is a standard procedure in the IFs software but requires some care and adequate data prior to the new initialization year to produce good forecasts. After the model was rebased, we compared IFs projections from 2008 to 2019 at the national level with historical data available for Nigeria. We made adjustments to account for any cases where the projections of core variables were significantly off at the national level.

In order to initialize variables at reasonable levels, we required data from 2008 or earlier. These figures are used to tell the model where to initialize variables to best portray development in Nigeria in 2008. Obtaining high-quality and representative data at the sub-national level is challenging even in the best circumstances, and many countries have only built up strong sub-national statistical capacity in recent years. Moreover, even at the national level, conflict is often a major barrier to collecting reliable data.

IFs has been developed using data from standard international sources like the World Bank's World Development Indicators. In some cases, the state-level data suggested a national value out of line with other

existing national-level data sources. In order to maintain consistency and ensure quality, we used the state-level estimates to distribute values based on national-level figures.

One critical development indicator for IFs is gross domestic product (GDP). Obtaining adequate coverage of state-level GDP was important to this project for two reasons. First, GDP is an important conflict impact to measure. Second, GDP is a crucial driver of many other variables within the IFs system. Official state-level GDP estimates have been produced for 22 Nigerian states from 2013 to 2017, but Adamawa, Borno, and Yobe were not among the states included.<sup>151</sup>

In the absence of official state-level GDP figures, we estimate GDP using satellite imagery. Nighttime light intensity has been used to estimate sub-national GDP in numerous African contexts,<sup>152</sup> including Nigeria,<sup>153</sup> and nighttime lights estimates have been incorporated successfully into IFs to estimate GDP in Uganda.<sup>154</sup>

For this project, we utilized remote sensing data from two sources: 1) the Defense Meteorological Satellite Program-Operational Line Scanner (DMSP-OLS) for earlier years (2008-2013), and 2) the Visible Infrared Imaging Radiometer Suite (VIIRS) for recent years (2015-2016). The light intensity dataset built for this project includes data reflecting the total light intensity per square kilometer on an annual basis. Additionally, we accounted for rural agricultural production by distributing agricultural GDP to rural areas without nighttime lights based on population density estimates, which is a technique that the Pardee Center developed and published in *Remote Sensing*.<sup>155</sup>

Finally, to validate the methodology, we compared our GDP estimations to those calculated by the NBS for other similar states, including north-eastern states Bauchi and Gombe. We found our estimates to be remarkably similar to the NBS figures for those states, supporting the adequacy of this methodology for estimating GDP in the BAY states.

See Table 4 for the full list of variables and data sources incorporated into IFs for this project.





**Table 4:** Data sources used to initialize the sub-national Nigeria IFs model. Years shown indicate the years from which data were incorporated to initialize the model in 2008. In some cases, data may have been available from the source for later years but were not used to initialize the model, cont.

Category	Variable	Sources	Years
Agriculture	Crop production	Nigeria Data Portal	2004-2006
Economy	GDP	Nighttime lights dataset constructed using DMSP-OLS and VIIRS	2008-2013, 2015-2016
Economy	GDP per capita	Calculated based on GDP estimates (nighttime lights) and population estimates (LandScan data)	2008-2013, 2015-2016
Education	Gross primary enrolment, by sex	Nigeria Demographic and Health Survey (DHS) 2008	2008
Education	Net primary enrolment, by sex	DHS 2008	2008
Education	Gross secondary enrolment, by sex	DHS 2008	2008
Education	Net secondary enrolment, by sex	DHS 2008	2008
Health	Contraception use	Federal Ministry of Health, Multi-Source Data Analytics & Triangulation Platform (MSDAT)	2014
Health	Life expectancy, by sex	Human Development Report (HDR) 2008	2008
Health	Malnourished children, percent under 5	Nigeria Data Portal	2007
Health	Infant mortality rate	Multiple Indicator Cluster Survey (MICS) 2011	2011
Health	Stunting	Nigeria Data Portal	2007
Health	Under-5 mortality rate	MSDAT	2011
Infrastructure	Electricity access, percent	DHS 2008	2008
Infrastructure	Sanitation access, levels	Nigeria Data Portal	2009
Infrastructure	Water access, levels	Nigeria Data Portal	2009
Population	Crude birth rate	NBS 2011, Table 146	2001-2005
Population	Crude death rate	NBS 2011, Table 147	2001-2005
Population	Population age-sex distribution	Nigeria Data Portal	2006
Population	Population in millions	LandScan Global Population Project	2000-2017
Population	Total fertility rate	MSDAT	2011
Socio-political	Death rate from conflict and terrorism	ACLED	1997-2019
Socio-political	Gini index	NBS Poverty Profile 2010	2004, 2010
Socio-political	Poverty percent, \$1.90/day in 2011 USD	NBS Poverty Profile 2010	2010







# APPENDIX B: FINE-TUNING THE CONFLICT SCENARIO







# APPENDIX B: FINE-TUNING THE CONFLICT SCENARIO

For this project, we needed to construct and adjust the *Conflict* scenario to best represent how development unfolded in the region. We also made some slight adjustments to the *No Conflict* scenario to represent a

realistic counterfactual scenario. We began with core assumptions (GDP growth, conflict fatalities, and conflict magnitude) and then adjusted key variables to reflect available data and literature.

**Table 5:** List of model assumptions in the Conflict and No Conflict scenarios

Variable	IFs parameter	Description of adjustment
<i>Both scenarios</i>		
GDP adjustment switch	gdpadjsw	Allows model to take in exogenous specifications for GDP.
Social violence to health switch	svtohlsw	Activates links between social violence variables (conflict-related deaths) to the health module.
Government revenue	govrevm	Adjustment for model behavior. Brings Nigeria country-level government revenue in line with national estimates from the IMF World Economic Outlook.
<i>No Conflict scenario</i>		
GDP	gdprext	GDP growth rates are calculated based on nighttime lights data (see Appendix A), adjusted based on World Bank calculations (see below). Growth in 2020 is adjusted to account for the economic effects of COVID-19.
Conflict deaths	svdthsadd	Conflict-related deaths are eliminated from 2009 onwards.
Conflict magnitude	sfintlwarmagm	Conflict magnitude is reduced to 0 from 2009 onwards.
<i>Conflict scenario</i>		
GDP	gdprext	GDP growth rates are estimated from nighttime lights data (see Appendix A) and adjusted to account for COVID-19 effects in 2020.
Conflict deaths	svdthsadd	Data on conflict-related deaths (direct deaths) are imported from ACLED through 2019. In 2020, we assume the daily death rate from January through May continues throughout the year. In 2021-2030, we impose the average annual deaths from 2016-2019.
Conflict magnitude	sfintlwarmagm	Conflict magnitude is adjusted based on conflicts with a similar intensity.

**Table 5:** List of model assumptions in the Conflict and No Conflict scenarios, cont.

Variable	IFs parameter	Description of adjustment
Crop yields	ylm	Reduces agricultural production in line with literature suggesting a sharp reduction in overall production.
Agricultural imports	agmm	Adjusts for model behavior, ensures that states don't make up for reduced yields by drastically increasing imports.
Primary education intake rates	edpriintnm	In conjunction with primary survival rates, brings primary-aged enrolment figures in line with attendance estimates from the MSNA.
Primary education survival rates	edprisurm	In conjunction with primary intake rates, brings primary-aged enrolment figures in line with attendance estimates from the MSNA.
Lower secondary transition rates	edseclowrtranm	Brings gross enrolment estimates within the range of MSNA estimates.
Upper secondary transition rates	edsecuprtranm	Brings gross enrolment estimates closer to the range of MSNA estimates. We make a stronger reduction on upper compared to lower secondary rates, based on attendance estimates from the MSNA.
Water access, piped	watsafem	Reduces access based on reports of destruction of infrastructure and limited access in IDP camps and host communities.
Water access, other improved	watsafem	Reduces access based on reports of destruction of infrastructure and limited access in IDP camps and host communities.
Sanitation access, improved	sanitationm	Reduces access based on reports of destruction of infrastructure and limited access in IDP camps and host communities.
Sanitation access, shared	sanitationm	Reduces access based on reports of destruction of infrastructure and limited access in IDP camps and host communities.

## GDP

GDP growth figures were exogenously imposed on both the Conflict and the *No Conflict* scenario. *Conflict* scenario GDP growth rates were based on state-level GDP estimates calculated from nighttime lights imagery (see Appendix A). Growth rates in the *No Conflict* scenario were adjusted based on a World Bank study which estimated GDP losses by state due to the conflict from 2011 through 2015.<sup>156</sup> A moving average was applied to growth rates to account for volatility in the nighttime lights data. Finally, growth rates were adjusted for 2020 in accordance with adjusted IMF

growth figures at the national level.<sup>157</sup> Thus, the economic impact of the global COVID-19 pandemic was accounted for in both the *Conflict* and the *No Conflict* scenarios. After 2021, GDP growth is calculated endogenously within the IFs model.

## Conflict fatalities and magnitude

Conflict fatality data are sourced from ACLED. ACLED publishes data on conflict-related events and fatalities globally and is used widely for academic research. Coverage of Nigeria in the ACLED database begins in 1997 and counts



are updated regularly. In the *No Conflict* scenario, we assume zero conflict-related deaths for all years. We adjust conflict-related deaths in the *Conflict* scenario based on the following:

- 2009-2019: Annual fatality counts for Adamawa, Borno, and Yobe are taken into the model.
- 2020: We calculate the daily death rate through 31 July 2020 and extend that through the rest of the year for a total 2020 fatality count.
- 2021-2030: We assume a constant annual fatality rate, based on the average annual deaths for the years 2017-2019.

We also adjusted a parameter controlling conflict “magnitude.” Conflict magnitude in IFs is an average index based on calculations from a dataset by the Political Instability Task Force/Center for Systemic Peace.<sup>158</sup> We adjusted the conflict magnitude parameter based on conflicts with similar death rates historically. Finally, a parameter in IFs measuring the likelihood of conflict is set to 1 in the *Conflict* scenario and 0 in the *No Conflict* scenario.

## Government revenue

We did not have adequate data for government revenue at the state level for Adamawa, Borno, and Yobe for our years of interest. However, in the modeling process we found that the sub-national IFs model was significantly overestimating national government revenue when we compared model figures with available data. We adjusted government revenue in both scenarios so that national-level government revenue is in line with data from the IMF.

## Education

We know that the conflict has affected educational attainment through direct attacks on facilities, causing displacement, and instilling fear in students and parents.<sup>159</sup> However, it is difficult to determine the magnitude of this impact. Countrywide surveys are often unrepresentative of conflict-affected areas and some of the data and estimates are contradictory. We took the following

sources into consideration when making interventions to educational attainment in IFs:

- A 2018 Multi-Sector Needs Assessment found that fewer than half of all children aged 5-15 were attending school, and less than 20 percent of those aged 15-19 were attending.<sup>160</sup>
- In 2019, over 60 percent of schools were closed in Borno, and schools across the three states had experienced disruptions and/or refused to enrol new students.<sup>161</sup>
- In at least half of IDP camps and host communities, it is reported that fewer than half of all children are attending school.<sup>162</sup>
- A UNDP report states that 2.9 million children are without access to education due to the destruction and damage to school infrastructure as a result of the conflict.<sup>163</sup>
- The Education in Emergencies Working Group Nigeria (EiEWGN) reports that 2.2 million girls, boys, and adolescents are reported to be without access to basic quality education and vocational training.<sup>164</sup>

IFs takes a pipeline approach to modeling education, moving student cohorts through primary, secondary, and tertiary levels according to available data. Education parameters also follow this approach. Intake and transition parameters affect the percentage of children who enter into primary education (intake) and who, after completing one level of education, move onto the next (transition from primary to lower secondary and from lower to upper secondary). Survival and completion parameters affect the percentage of children who complete the level in which they are enrolled. We chose to reduce primary education through both intake and survival parameters and to reduce lower and upper secondary education through transition parameters.

## Agricultural production

Numerous studies and reports attest to a sharp reduction in agricultural production as a result of the conflict.<sup>165</sup>

A few estimates suggest that production has fallen by as much as 80 percent for certain crops.<sup>166</sup> But we were unable to find any broad, regional, and absolute estimates

of the conflict's damage to agriculture. We assumed that the conflict has resulted in reduced production, but also assumed that the magnitude of that reduction over ten years would be less than the drastic reductions cited for specific crops.

There is no direct parameter in IFs that controls agricultural production. Rather, agricultural production is impacted by two separate parameters: agricultural yields and land under cultivation. Reports on north-eastern Nigeria suggest that falls in production are the product of both lower yields and land abandonment. For simplicity and because the yield parameters offer greater control, we adjusted production by altering yields.

Additionally, IFs is inclined to make up for production deficits by drastically increasing agricultural imports to the region. We do not have data on agricultural imports into Adamawa, Borno, and Yobe (which would include both international imports as well as movement of agricultural products from other Nigerian states), but we imposed a restriction on the growth of imports to adjust for this model behavior. In this scenario, imports are allowed but are limited.

## Water and sanitation

In conflict settings, access to water and sanitation can be lost for numerous reasons. Physical water and sanitation infrastructure may be destroyed, planned expansion of access may be delayed, and families may be displaced from areas in which they have access. We were unable to find high-quality, representative estimates of the percentage of the population with access to water and sanitation in north-eastern Nigeria, but reports suggest that access has been reduced. According to UNDP, the conflict has resulted in the destruction of 75 percent of water and sanitation infrastructure.<sup>167</sup> And it is frequently reported that IDPs have limited access to water and sanitation due to overcrowding and shortages of water and material.<sup>168</sup>

IFs provides three categories each for access to water and sanitation. Water access is categorized as piped, other improved, and unimproved. Sanitation access is categorized as improved, shared, and other unimproved. We reduced the population with access to the top two levels of both water and sanitation to account for reduced access.



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# ENDNOTES







# ENDNOTES

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