

Testing Resource Development Scenarios to Determine Impacts on the Economy and Labour Force

Technical Memorandum

Impact Economics

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Technical Memorandum: Testing Resource Development Scenarios to Determine Impacts on Economy and Labour Force

This report provides the results of detailed analytical research that tested resource development scenarios for the Diamond Mining sector of the NWT economy. Of principal concern is how project start dates and NWT resident labour force participation rates affect the NWT economy, its labour force, and its population.

The NWT Economic Impact Model was employed as part of this analytical work.¹

A brief statistical overview of the NWT economy is provided in order that the results from the different scenarios can be placed into the current economic context.

The NWT Economy

This section provides a statistical overview of the NWT economy, labour force, and population. The variables presented include:

- Population
- Migration
- Economic Activity
- Employment
- Unemployment Rate

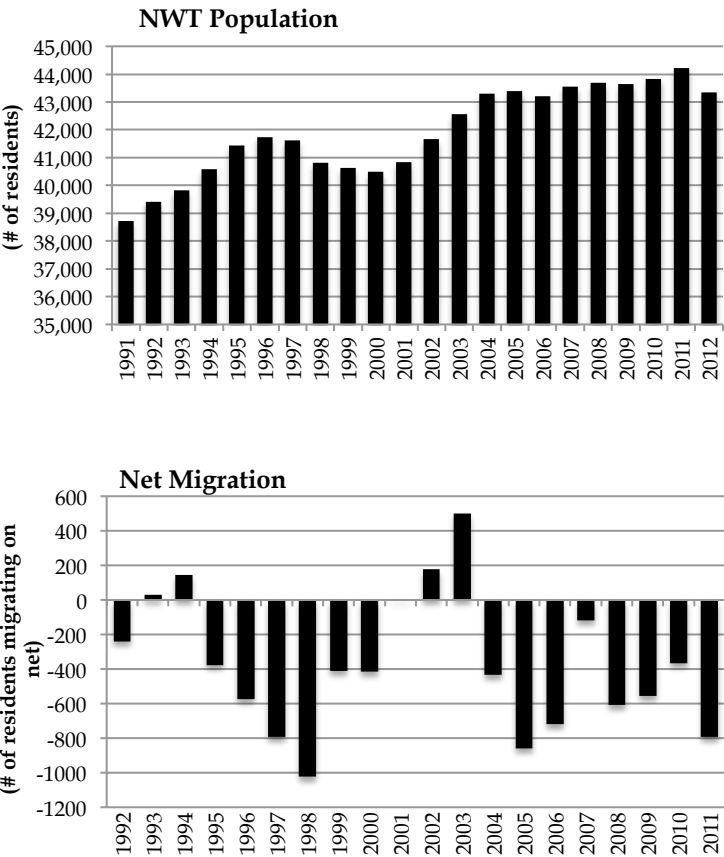
The variables were chosen because together they provide a reasonable picture of the current economic situation. Additional data such as personal income, government direct tax revenues, labour force, and induced impacts reinforce the story told by these indicators.

¹ The NWT Economic Impact Model was developed by Impact Economics to study the impacts of major projects on the people and economy of the Northwest Territories.

Population

The NWT population has undergone four distinct periods of growth over the past 20 years, but it is the last of these periods, from 2004 until today, that is most relevant to this analysis. The territory’s population has not changed markedly in this time period. There was an increase in 2011 that saw the overall population grow above 44,000, but this has not held. The estimate for 2012 shows a decline in the most recent year that puts the territory’s population below what it was in 2004.²

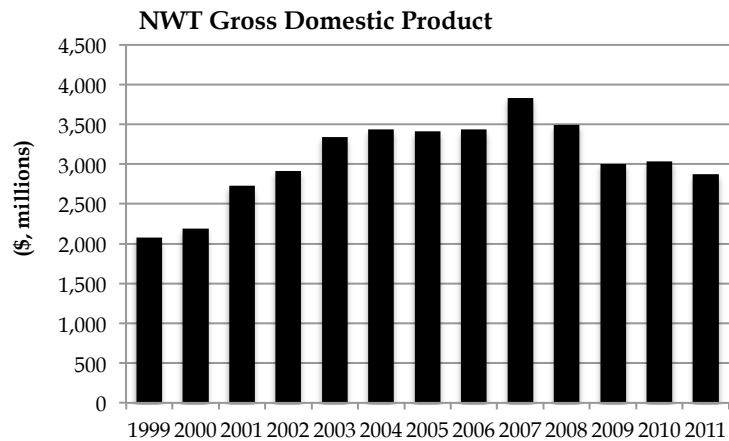
There is evidence that the stagnant population is the result of migration away from the territory. Using the statistics on births and deaths at the community level and cross-referencing that with estimates of community populations suggests that NWT residents are moving from smaller communities into larger ones and from all communities to southern Canada.³



² Data sourced from NWT Bureau of Statistics, *Labour Force Activity* (www.statsnwt.ca)
³ See the NWT Bureau of Statistics community population estimates and Statistics Canada’s statistics on births and deaths, all of which are available on the NWT Bureau of Statistics’ website (www.statsnwt.ca).

Economic Activity

Economic activity is typically measured through the statistic “gross domestic product” or GDP. Technically speaking, GDP measures the monetary value of all goods and services produced in a region in a given time period and sold to consumers, government, industry or are exported. By this measure, the NWT’s economic activity has fallen consistently since its peak in 2007, which is a year that saw diamond production reach 16 million carats, employment at the diamond mines top 4,100, and major capital projects occurring at all three sites.



The worldwide recession that began in late 2008 brought about temporary shutdowns at Snap Lake and Diavik in the summer of 2009. Production has been on the decline since that time. Less than 10 million carats were recovered in 2011, while employment at the three mines was reported to be just over 3,100.⁴

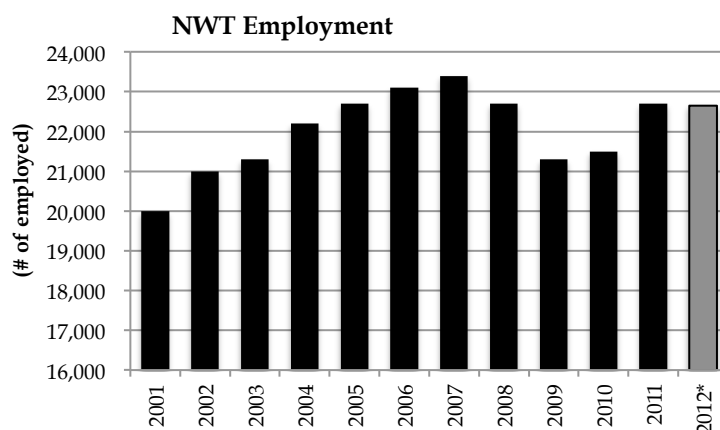
The public sector expanded its capital expenditures through the use of federal deficit spending to mitigate the effects of the recession, but this was not enough to sustain the economy at its previous levels. That special-purpose funding has now been spent. The latest capital budget for the GNWT for 2013-14 is \$123 million, which is \$159 million lower than the average annual capital expenditure for the NWT since 2009-10.⁵ Meanwhile, economic activity elsewhere in the NWT has not grown enough to return the region’s economy to its previous peak. The somewhat stagnant economy is noteworthy because, in the absence of new growth, it can be a signal of an eventual decline in the demand for labour and capital, meaning a reduction in labour force activity, a drop in disposable income, less demand for business and consumer services, and a drop in standards of living.

⁴ See NWT Bureau of Statistics *Mineral Estimates* and the Socio-economic Monitoring Reports produced by the mine operators.

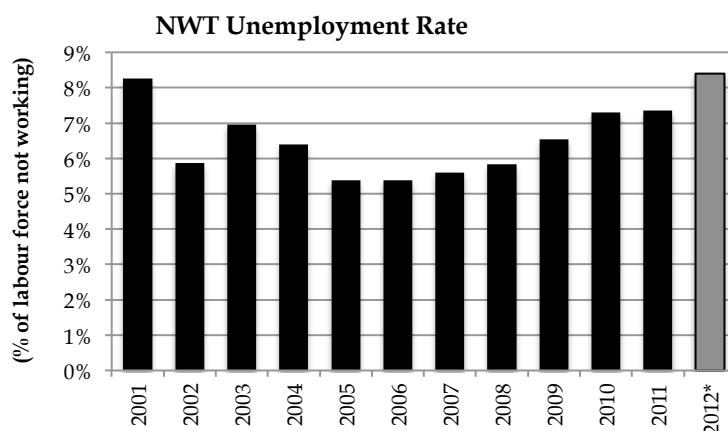
⁵ See GNWT’s Capital Estimates from 2011-12 to present.

Employment and Unemployment Rate

The sectors of the NWT economy that employ the most people are government including health and education, retail trade, mining, and construction. The number of people working in the NWT fell during the recession of 2008-09.⁶ Many of the losses came in the mining industry, in the businesses that support mining activities, and construction. The number of jobs has not yet returned to previous levels, though there was job growth in 2011. Growth that year was due entirely to job creation in the service-producing industries with the greatest increase coming in the form of public administration jobs. Employment has held steady in 2012.⁷



Future sustained job growth will not likely come from the existing mine operators. Collectively, these deposits are past their peak years of production. BHP Billiton has announced that Ekati will cease operations in 2019 two years ahead of its original schedule. The announced sale of this property might extend its life, but there is no evidence yet to make a definitive statement on how future activities might change, including how the Ekati and Diavik Diamond Mines might work together.⁸



Diavik remains close to its schedule, and as expected, it made the transition to an entirely underground operation during the latter half of 2012. Ekati and Diavik are both likely to reduce their overall labour force beginning in late 2012 and throughout 2013. De Beers, in publications the company produced for its recent Snap Lake Mine water license application, indicated the Snap Lake Diamond Mine would be operational until 2030. This will not generate new employment but will extend the life of existing jobs.

⁶ The employment and unemployment data were sourced from the NWT Bureau of Statistics, *Labour Force Activity* (www.statsnwt.ca).

⁷ Note that the employment and unemployment data for 2012 are based on the first 10 months of the year.

⁸ Harry Winston Diamond Corporation, *Harry Winston announces agreement to purchase Ekati Diamond Mine*, November 13, 2012 (investor.harrywinston.com).

Resource Development Scenarios

The stated purpose of this technical memorandum is to test resource development scenarios to better understand the affects on economic activity and NWT resident labour force. The NWT Economic Impact Model is a tool built for this purpose. Among other things, it allows for the addition or subtraction of major resource projects, adjustment to the start and end dates of existing or future projects, the alteration of production rates, and changes to NWT resident labour participation rates. In this study, the focus is on the existing economic and labour force conditions and how the addition of the Gahcho Kué Diamond Project could alter these conditions.

Description of the scenarios assessed

The first simulation assumed the economic outlook was unchanged since the Gahcho Kué Diamond Project Environmental Impact Assessment was finalised. At that time, the mine plans at the Ekati, Diavik, and Snap Lake Diamond Mines indicated that Ekati would operate until 2021, Diavik until 2022, and Snap Lake until 2026. An economic impact assessment was run with these assumptions in place to establish what would have been the baseline in 2010.

The second simulation altered the outlook for the three mining operations according to information available as of October 2012. BHP Billiton has shortened the mine life of Ekati by two years with operations expected to end in 2019. Diavik's schedule remains unchanged. For Snap Lake, an operational life to 2029 was applied in this updated scenario. This was selected on the basis that the mine life presented by De Beers in the environmental assessment for Snap Lake was 22 years, and the mine began production in 2008. This simulation establishes a new baseline. The economic impact scenarios for Gahcho Kué Diamond Project are based on this new set of circumstances.

The third simulation adds the Gahcho Kué Diamond Project. There are three different scenarios investigated here, with each successive simulation making subtle changes to the projects timing and NWT resident labour force participation rates.

- 1) Gahcho Kué Diamond Project is added to the economic baseline in 2013 with the share of jobs for the NWT resident labour force based on the results at Snap Lake; 2013 was the original schedule proposed in the EIS, while the Economic Impact Report (Appendix 12.II) used the Snap Lake employment participation results stating that this was a cautious assumption that will produce equally cautious results.
- 2) Gahcho Kué Diamond Project is added to the economic baseline in 2014 with the share of jobs for the NWT resident labour force based on the average for all three operating diamond mines; this is more reflective of the timeline in the work plan for the Gahcho Kué Project Environmental Impact Review, which was issued by the Mackenzie Valley Environmental Impact Review Board, while the participation rate was changed to show how a less cautious assumption on resident labour force participation would affect the NWT economy, labour force activity, and population.
- 3) Gahcho Kué Diamond Project is added in 2018 with the share of jobs to the NWT resident labour force based on the average participation for all three operating diamond mines; this scenario delays the start date by five years from the original date proposed in the EIS to demonstrate the cumulative effects of the four mining projects if Gahcho Kué did not start

until the end of Ekati's operating life, while the resident labour share of jobs was held equal to the previous simulation.

Choosing which of these scenarios produce the greatest benefits to the NWT depends entirely on the methodology chosen to measure benefits. For example, using net present value and GDP would favour an early start date. Using the total number of jobs created as the measure would show that all scenarios are equal since we are not altering the size, scope, or production rate of the projects being studied. If the number of jobs filled by NWT residents were the measurement, then whatever scenario makes the highest assumption in this regard would be shown to be the best.

The challenge with using this last approach (number of jobs to NWT residents) is in understanding how or why the share of jobs might change. In all cases, an assumption is needed—but some of these assumptions would not likely hold in reality, while others will result in improved participation but at the expense of other NWT projects, leaving the net gain to the territory equal to zero.

Some of the possible assumptions that would alter the share of jobs filled by NWT resident labour force include (no doubt there are many others):

- the NWT population grows larger than is projected, meaning a larger source population and larger potential labour force—one could imagine that for this assumption to hold the NWT would have to improve its record of attracting and retaining residents;⁹
- the graduation rates are assumed to improve at a pace substantially greater than what is already being achieved resulting in a rise in the number of residents who qualify for entry-level positions—there is evidence of some improvements in this area, but also of a deteriorating standard amongst graduates;
- the Project could attract labour from other projects—there could be a variety of different means to achieve this, but it would be primarily through offering higher wages and benefits than other operators, this would ultimately be self-defeating however as it would result in wage inflation across the industry with the net gain in terms of participation to any one operation being zero.

There are more prudent assumptions and some facts that suggest the Gahcho Kué Diamond Project will attract an NWT resident labour force at least equal to what is being achieved at the Snap Lake Diamond Mine initially, with a reasonable probability that this will improve over time. These assumptions include

- the ageing of the existing population bringing new graduates into the labour force,
- a gradual improvement in graduation rates,
- a slow but steady increase in the willingness of NWT resident labour to work fly in/fly out (FIFO) jobs,
- the movement of some labour from other projects because of the open-pit mining operations and/or because it will be new and some people will be looking for a change,
- later, movement of labour from other projects will occur because of layoffs or closure.

⁹ The challenges the territory faces here were illustrated by the *2009 NWT Survey of Mining Employees* which was produced by the NWT Bureau of Statistics with support from the three mine operators and the GNWT.

The NWTEIM contains a dynamic response from the labour market to changes in the demand and supply conditions within the NWT economy. For example, a rise in the number of unemployed residents combined with a decline in the number of available jobs can result in improved participation as a percentage of the overall workforce, but this does not necessarily mean a higher number of jobs in absolute terms. Similarly, a rise in the number of jobs available can result in a slower out-migration and possibly in net in-migration. This would result in a higher absolute number of NWT residents working in the industry, but the share of jobs might actually decline.

Understanding what we control in an economic impact study

It can be interesting to understand how variations in a project's design, timeframe, and inputs can influence development in the NWT. Studies such as this one can be used to understand the ebb and flow of an economy, where the NWT can improve its performance, and how it can raise the standard of living of all residents.

But there is a risk in thinking it possible to control the inputs to economic growth in such an overt manner as suggested by these simulations. As residents of the NWT, we have no control over the variables that have the greatest influence on if, when, and where a mine will open. NWT residents have no control over world economic conditions, which influence commodity prices, investor confidence, and the financial feasibility of mining projects. There can be no control over the size, location, or nature of a deposit and hence we cannot control the mine life, its geographic location, or the most efficient mining method. Regarding participation, the NWT has no control over the economic growth and the demand for labour elsewhere, whether in other regions within Canada or abroad, which might alter the competition for existing or potential NWT resident labour.

We cannot control these externalities, but we can learn about them and understand how they might affect the growth and development of the NWT. It is important that the results of these simulations be considered in the context of the current and future economy of the NWT, and in the context of external factors that will affect demand and supply conditions of the territory.

Economic impact assessments versus economic forecasts

The economic impact assessments described in this report should not be mistaken as forecasts of the NWT economy.

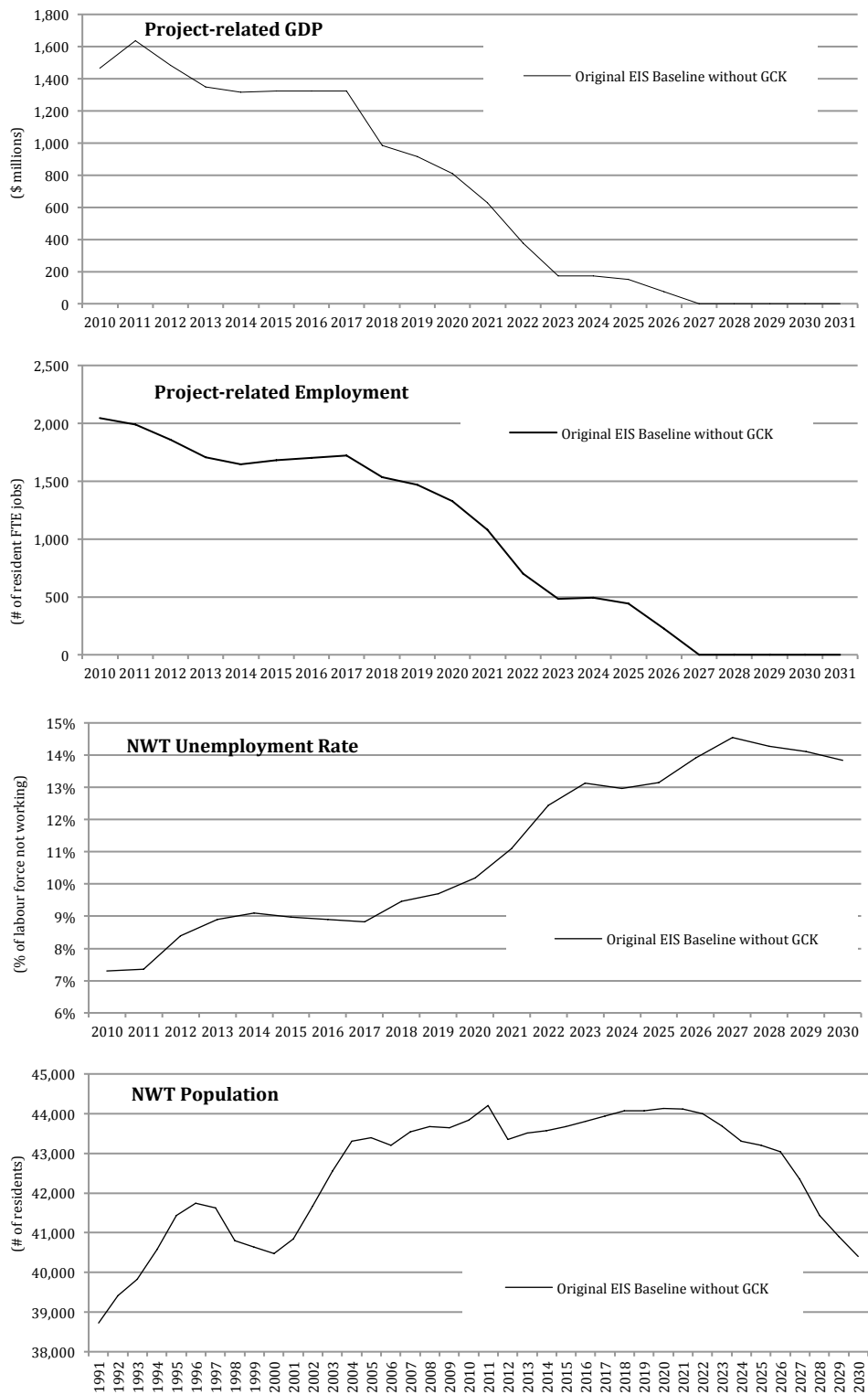
An economic impact assessment does not consider demand and supply forces outside the realm of what is being studied nor does it allow for a full market response to the economic impact being studied. This means that potential changes to economic activities and developments occurring elsewhere in the region are not introduced unless done so explicitly as part of the scenario being studied. For example, there is potential for oil and gas exploration to occur in the Sahtu region of the territory. This would have implications for the territory's economy, but unless it is included as part of the scenario, it is ignored. A full market response refers to the reaction of all economic agents to the outcomes of an economic scenario. For example, a scenario whereby Ekati, Diavik, and Snap Lake Diamond Mines close with no other major developments occurring over the next fifteen years would bring about a rather dramatic economic decline in the NWT. A forecaster would have to determine when and how government would respond to this pending decline. Would transfers from the federal government increase? Would incentives to invest in the territory change and would those incentives then stimulate new economic opportunities and if so, which ones and by how much?

The NWT Economic Impact Model does not make judgements on the reactions of economic agents such as government; it doesn't assume technological changes that might alter the required mix of labour and capital, or a change in the structure of the economy such as improved economies of scale or the establishment of new industrial goods and services provided by NWT business. A forecast would have to establish one set of circumstances for all of these variables as well as establishing a definitive position on all other resource projects in the NWT, on world demand for commodities, and on national economic growth and demand for labour.

The NWTEIM looks at how each project combines with the existing economy, and allows the increase in demand for labour and capital to influence direct, indirect, and induced economic activity, labour force participation, personal income, demographic movements, and government revenues. It is imperative that the results from this model be combined with knowledge of the NWT and its economy in order to understand the forecast that would result under each set of circumstances.

Results from Resource Development Scenarios

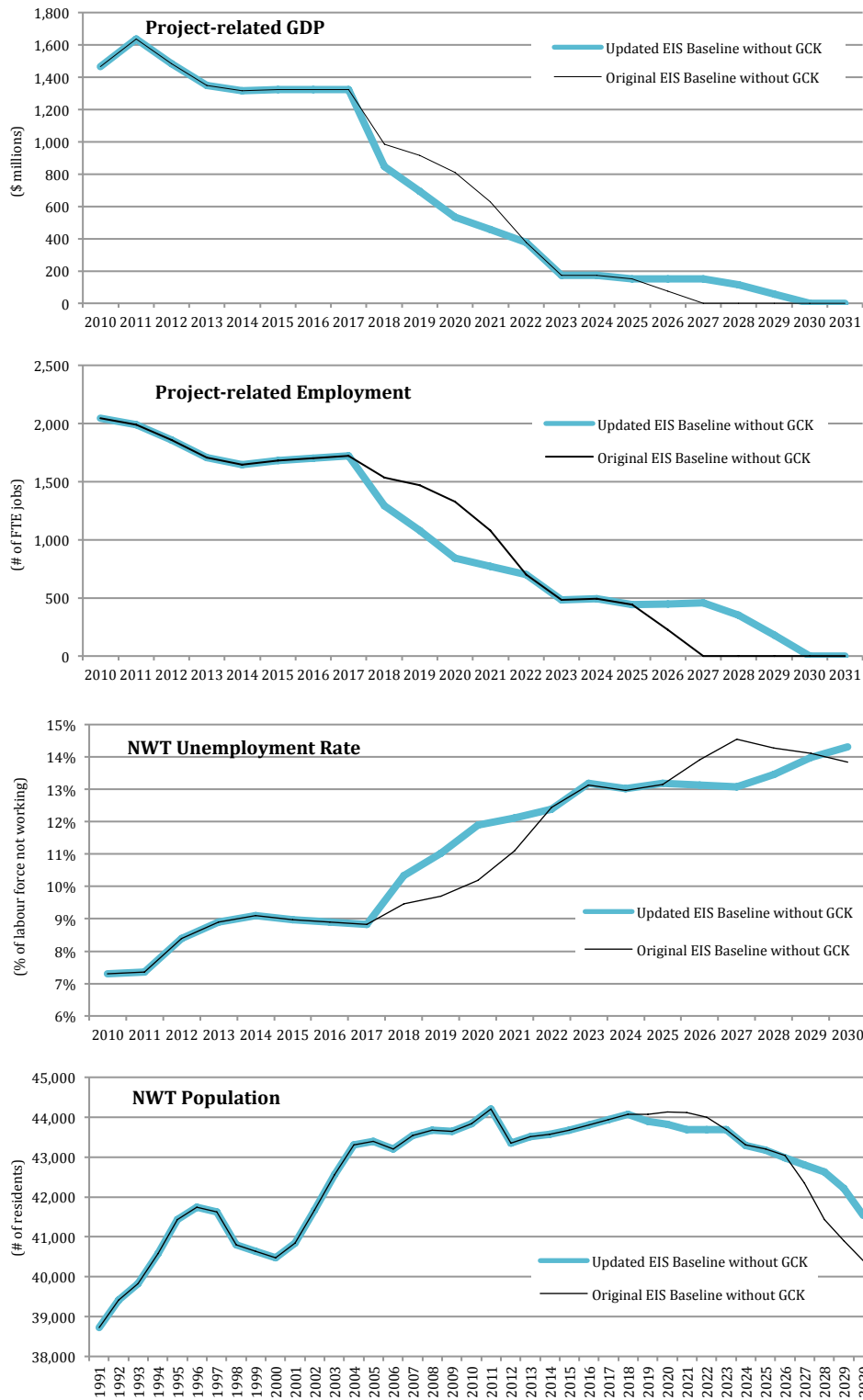
Scenario One: Economic Baseline from 2010



Scenario One represents the baseline conditions related to Ekati, Diavik, and Snap Lake Diamond Mines as of 2010. It shows the magnitude of change brought on by the closure of these three mines in 2021, 2022, and 2026 respectively. These mines employed approximately 3,100 people in 2011. Under this scenario, all of these jobs will be gone by the end of 2026, with the decline starting in earnest after 2017. Without any other sources of job creation, the unemployment rate would rise from its current level between 8 percent and 9 percent to over 13 percent by 2023. The loss of jobs and rising unemployment would eventually bring about an out-migration of residents.

One has to treat the results from this scenario with caution. Again, it is an important reminder to state that this scenario is not a forecast, but rather the economic results of a specific set of circumstances. One would expect there to be some form of economic growth in the next 15 to 20 years, even if it is not clearly identified today. But if this scenario were to become a reality, the implications are so extreme that a model such as the NWTEIM can only point us in the direction of where and to what extent changes will occur.

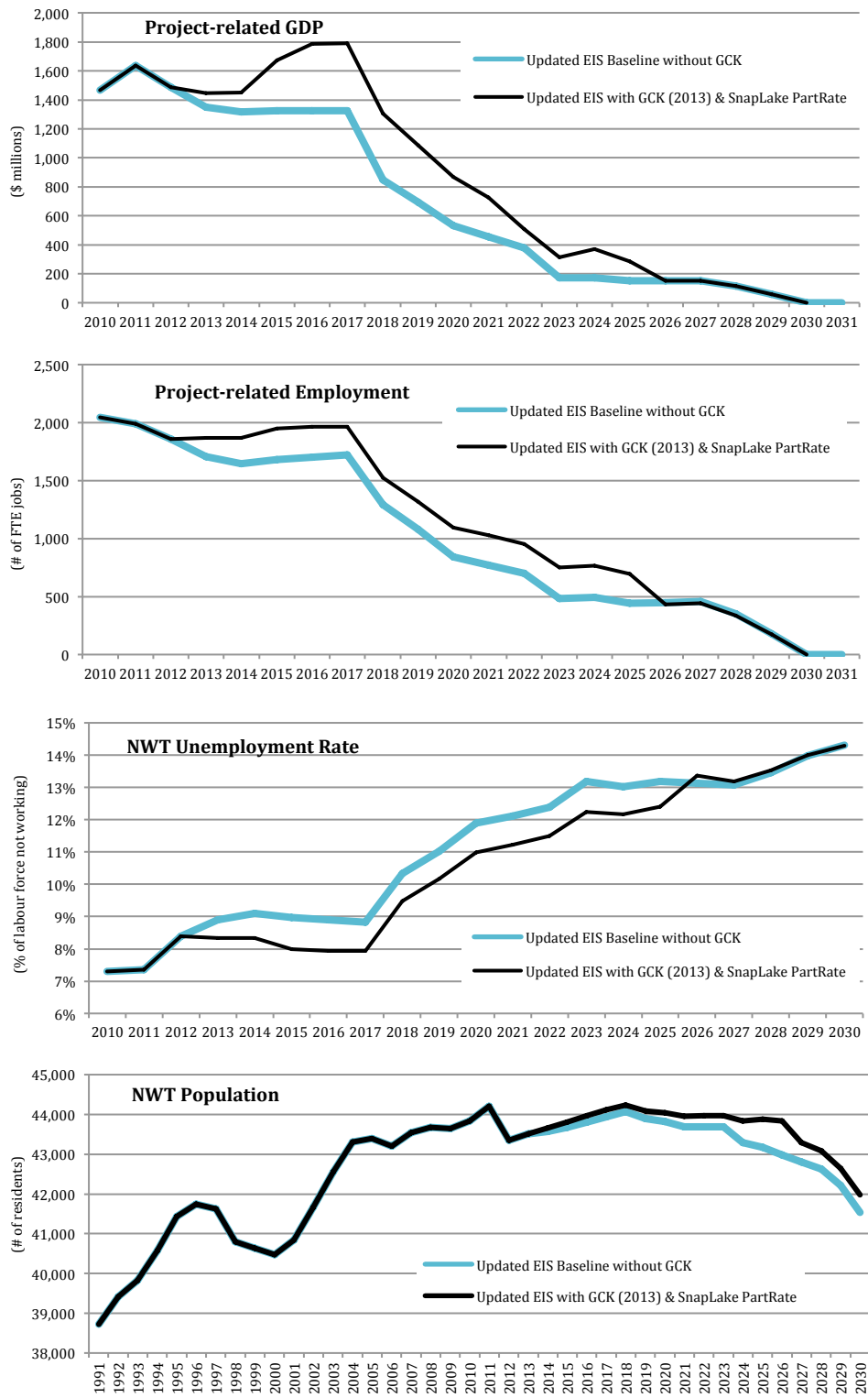
Scenario Two: Economic Baseline from 2012



Scenario Two makes minor adjustments to two of the three mining projects, shortening the life of Ekati by two years, and extending operations at Snap Lake until 2029. The most significant implication of these changes is how it increases the rate of economic decline from 2017 to 2020 when compared to Scenario One. In this scenario, the NWT is only five years away from the onset of this decline. The impacts of the extended mine life at Snap Lake show up in the outer years of the assessment.

While it can be said that the scenario is extreme in its lack of future developments, it can also be said that this is the current path of the NWT economy until a new development occurs. From that perspective, it stands as a useful baseline from which one can study the impacts of the Gahcho Kué Diamond Project.

Scenario Three: Economic Baseline from 2012 *plus* Gahcho Kué in 2013, NWT Labour Force Participation equals that of Snap Lake Diamond Mine

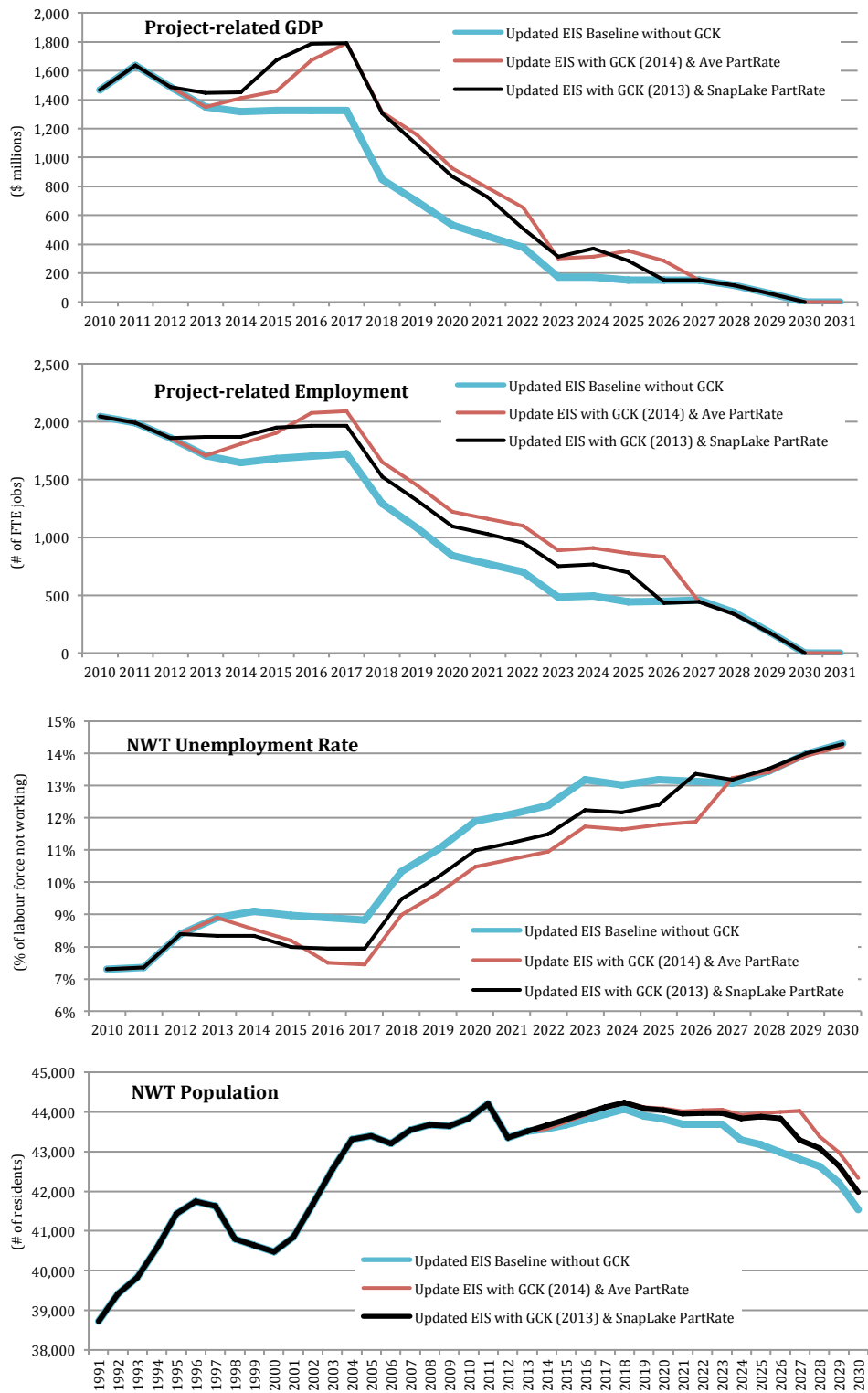


Scenario Three introduces the Gahcho Kué Diamond Project to the baseline scenario. The figures demonstrate the impacts of this project relative to that baseline. In this scenario, the new mine is introduced in 2013 with a NWT resident labour force equal to the percentage achieved at the Snap Lake Diamond Mine. It was stated in the Economic Impact Report (Appendix 12.II of the EIS) that this is a cautious assumption. It gives a starting point for understanding the employment implications of the project.

One can observe that this project is relatively small in comparison to Ekati and Diavik. Its addition to the economy maintains project-related employment at or near current levels for about five years, mitigating some of the initial lay-offs at Ekati and Diavik. However, once those two mines wind down their operations, the total number of jobs in the economy will still plummet.

The NWTEIM allows for a rise in the percentage of NWT resident labour working at Snap Lake and Gahcho Kué Diamond Mines during this time, which helps to offset the negative implications of the closures. This increased NWT workforce is enough to maintain the territory's population for a few additional years. Beyond 2030, under this scenario, there are no operating mines.

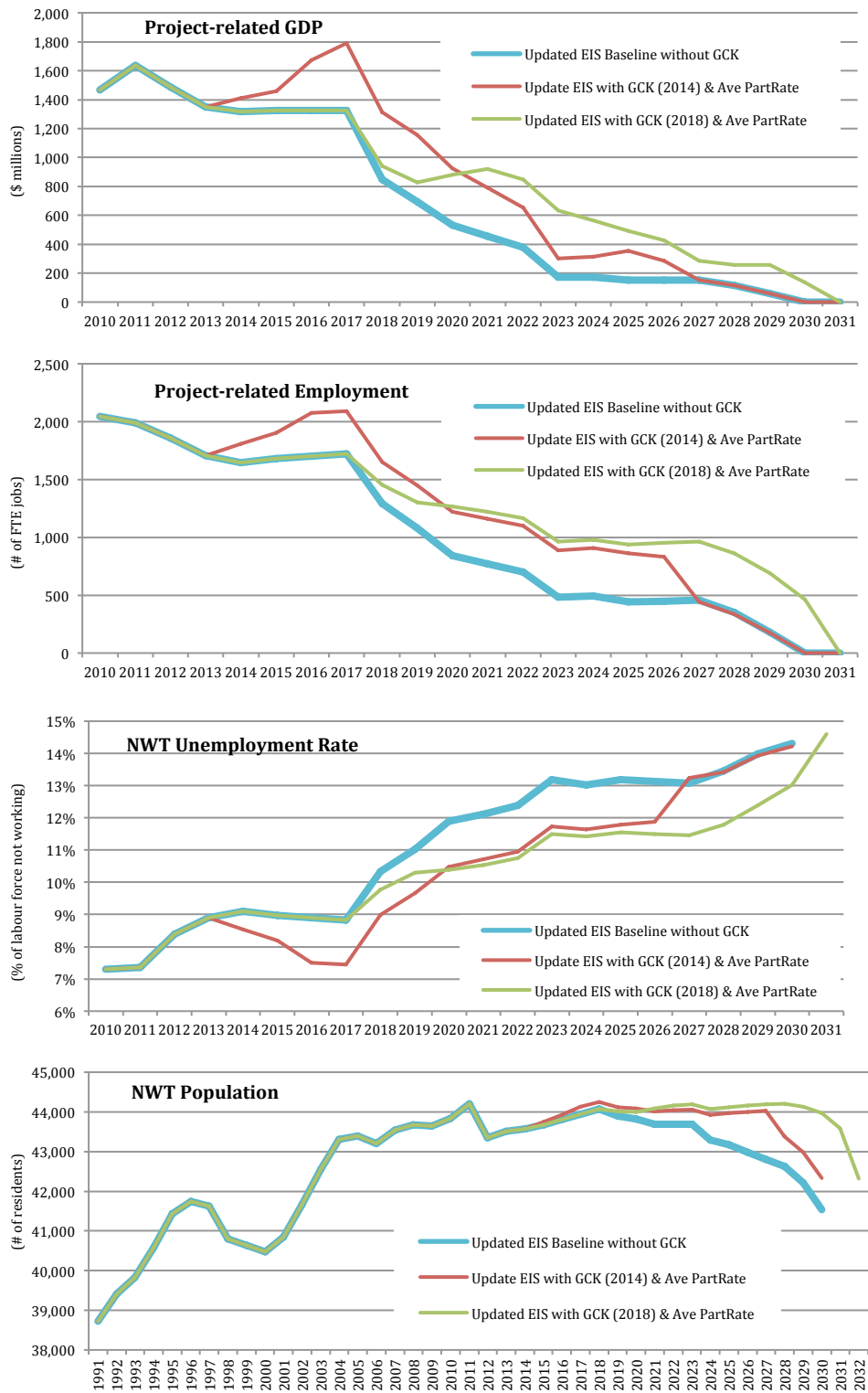
Scenario Four: Economic Baseline from 2012 *plus* Gahcho Kué in 2014, NWT Labour Force Participation equals that of Mining Industry Average



Scenario Four pushes back the start date of the Gahcho Kué Diamond Project by one year to 2014. This Scenario was selected based on a review of the timeline associated with the work plan issued by the Mackenzie Valley Environmental Impact Review Board for the Gahcho Kué Project. The Panel's work plan shows the decision for the Environmental Impact Review is anticipated in mid 2013. The scenario also allows NWT resident labour force participation at Gahcho Kué to equal the average across all three mines. In 2011, this average was 51 percent. The NWTEIM adjusts this level of participation each year according to the demand and supply conditions present in the economy as it is presented in the scenario. This higher participation rate reveals the relative implications of a less cautious (or more optimistic) assumption regarding participation.

The one-year delay in the start date does mean a slight setback in the economic recovery that could have occurred had the Project started next year. This is made up for by the assumption of a larger resident workforce. It is still the case that the project will not offset the negative implications of the slow down and eventual closure at Ekati and Diavik. The increased NWT resident labour participation and annual adjustments based on supply and demand conditions combined with the altered timing results in approximately 100 more jobs for the resident labour force under this scenario, which translates into a slightly larger population and labour force, and an unemployment rate approximately $\frac{1}{2}$ percentage point lower.

Scenario Five: Economic Baseline from 2012 *plus* Gahcho Kué in 2018, NWT Labour Force Participation equals that of Mining Industry Average



The final scenario, Scenario Five, moves the Gahcho Kué Diamond Project back by five years from the date originally proposed. By this time, 2018, the economy will be just starting to slowdown as a result of layoffs at Ekati and Diavik. The figures show that this delay effectively trades higher employment from 2014 to 2020, for higher employment beyond 2027. Inbetween these dates, that is 2021 to 2026, the difference in overall employment between the two scenarios is negligible. A similar pattern can be seen in the unemployment rates. In Scenario Four, the unemployment rate falls below 8 percent for the years just prior to the slowdown at Ekati and Diavik. The scenarios share similar unemployment rates from 2020 to 2026, growing from 10.5 percent to between 11.5 percent and 12 percent. Delaying the project does keep the population stable for an additional four or five years, from 2027 to 2031, but we should expect the number of people migrating away from the territory to rise sharply after the project closes and in the absence of any other economic activity.

Corresponding Data Tables

	Scenario	2001	2006	2011	2016	2021	2026	2030/31*
Project-related Gross Domestic Product¹	One			1,636	1,325	629	76	0
	Two			1,636	1,325	456	152	0
	Three			1,636	1,787	727	153	0
	Four			1,636	1,674	792	286	0
	Five			1,636	1,325	921	428	0
Project-related NWT Resident Employment²	One			1,988	1,701	1,079	223	0
	Two			1,988	1,701	771	449	0
	Three			1,988	1,965	1,029	431	0
	Four			1,988	2,078	1,162	832	0
	Five			1,988	1,701	1,224	953	0
NWT Unemployment Rate³	One	8.7%	5.3%	7.3%	8.9%	11.1%	13.9%	13.8%
	Two	8.7%	5.3%	7.3%	8.9%	12.1%	13.1%	14.3%
	Three	8.7%	5.3%	7.3%	7.9%	11.2%	13.4%	14.3%
	Four	8.7%	5.3%	7.3%	7.5%	10.7%	11.9%	14.2%
	Five	8.7%	5.3%	7.3%	8.9%	10.5%	11.5%	14.0%
NWT Population	One	40,844	43,198	44,212	43,814	44,122	43,033	40,395
	Two	40,844	43,198	44,212	43,814	43,688	42,984	41,534
	Three	40,844	43,198	44,212	43,976	43,952	43,843	41,978
	Four	40,844	43,198	44,212	43,926	44,012	44,005	42,332
	Five	40,844	43,198	44,212	43,814	44,089	44,161	43,584
Notes:								
* The NWTEIM is programmed with a 2030 end date. Because the Gahcho Kué Diamond Project closes in 2030 in Scenario Five, it was necessary to extend the model by a year to 2031 to see the affects of closure. For population, the demographic model was extended to 2032. The data in the last column are the results for 2030 for Scenarios One through Four, and 2031 for Scenario Five (2032 for population).								
(1) Gross Domestic Product is the measure of economic activity generated by the major projects included in the study, including indirect and induced impacts								
(2) Employment is the direct, indirect, and induced employment created by the projects in each scenario								
(3) Unemployment rate is for the entire NWT labour force								
(4) The last data point for population for Scenario Five is for the year 2032								
Scenario One	Original Economic Baseline in EIS (2010); Ekati (2021), Diavik (2022), Snap Lake (2026)							
Scenario Two	Updated Economic Baseline (2012): Ekati (2019), Diavik (2022), Snap Lake (2029)							
Scenario Three	Economic Baseline from 2012 <i>plus</i> Gahcho Kué in 2013 & NWT resident labour force participation (share of jobs) equal to Snap Lake							
Scenario Four	Economic Baseline from 2012 <i>plus</i> Gahcho Kué in 2014 & NWT resident labour force participation (share of jobs) equal to Mining Industry Average							
Scenario Five	Economic Baseline from 2012 <i>plus</i> Gahcho Kué in 2018 & NWT resident labour force participation (share of jobs) equal to Mining Industry Average							

Observations

The economy of the NWT is, at present, quite strong with its three diamond mines that are collectively creating 3,100 FTE jobs. However, without any new developments in the next five years, the current economic conditions will begin to change quite rapidly. By that time, the Ekati Diamond Mine could be closed or be in the process of closing and the Diavik Diamond Mine would be scaling back and will close a few years later. This leaves only the Snap Lake Diamond Mine, which is the smallest of the three. The economic and social implications for an economy losing these projects without anything to replace them are potentially extreme. In this scenario, the NWT unemployment rate would rise above 14 percent and the population would begin to leave en masse. One could imagine this would have negative implications for consumer confidence, amongst other things.

The three scenarios introducing the Gahcho Kué Diamond Project show the project to be relatively small when compared to the existing mining industry, but quite important in its mitigating role against the negative implications from the slowdown and closure of Ekati and Diavik. All three scenarios show this mitigating function. The Project will create 575 full-time jobs at its peak in a territory that, by 2014, will not have seen any new and significant private-sector investments or any long-term job creation for 7 years since the Snap Lake Diamond Mine began its operations in 2008.

Higher NWT resident labour force participation improves the economic benefits to the territory by lowering unemployment, discouraging out-migration, and increasing personal income. It is reasonable to believe that the percentage of NWT resident labour working at the project will improve overtime. At issue seems to be the level of participation that it will have when the mine opens, with the scenarios studying a starting point below 40 percent and another just above 50 percent. The difference is somewhat negligible and could be easily influenced by a variety of changes in the NWT or Canadian economy for which NWT residents have little or no control over.

An earlier start date also improves the economic benefits to the territory from the perspective of maintaining the current level of economic vitality for a period of five to seven years. The only real gain to delaying the Project by five years is the impacts on the economy beyond 2026. We would consider this too far into the future to have any confidence in what else might be influencing the NWT economy or labour force at that time, not to mention how the world economy might have changed.

This report did not make any assessments of other economic growth opportunities that might exist throughout the NWT. Nor did it consider the world economic climate and how it might be affecting the financial viability of existing or potential projects. When evaluating this or any other potential project, it would be important that this context be included.