

AFRICAN DEVELOPMENT BANK

**AN INFRASTRUCTURE ACTION PLAN FOR
BURUNDI**

ACCELERATING REGIONAL INTEGRATION

ANNEXES TO THE MAIN REPORT

SEPTEMBER, 2009

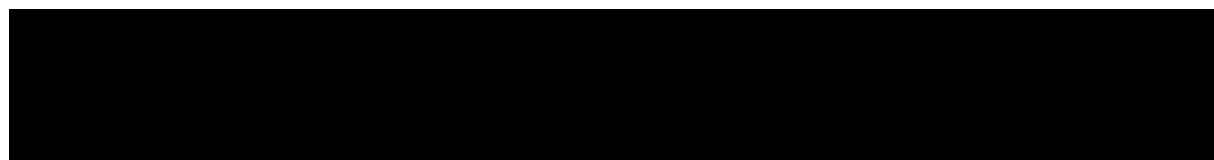
TABLE OF CONTENTS

ANNEX I: NATIONAL INCOME ACCOUNTS FOR BURUNDI.....	3
ANNEX II: POPULATION AND DEMOGRAPHIC CHARACTERISTICS OF BURUNDI.....	8
ANNEX III: LABOR FORCE AND EMPLOYMENT IN BURUNDI.....	13
ANNEX V: ESTIMATION OF INTERNATIONAL FREIGHT MOVEMENTS TO AND FROM BURUNDI	28
ANNEX VI: MACROECONOMIC PROJECTIONS FOR BURUNDI	32
ANNEX VII: DATA FOR THE ELECTRIC POWER SECTOR IN BURUNDI	40
ANNEX VIII: DATA FOR THE TRANSPORT SECTOR IN BURUNDI	61
ANNEX IX: DATA FOR THE COMMUNICATIONS SECTOR IN BURUNDI	74

ANNEX I: NATIONAL INCOME ACCOUNTS FOR BURUNDI

NATIONAL INCOME ACCOUNTS DATA AND SOURCES

Though the Departement de la Planification Centrale releases estimates of GDP by industrial origin from time to time¹, Burundi has not prepared an official set of national income accounts since 1998. The International Monetary Fund (IMF), World Bank and United Nations Statistical Office also publish estimates for these accounts. For some years, there are significant differences among these various estimates. Annex Table 1.1 below provides a comparison of some of these estimates for GDP at current market prices. The Government database also contains estimates for national income accounts by expenditure category for the period 1990-2004. The IMF publishes expenditure data at current market prices on a regular basis, as does the UN Statistical Office. Again, there are significant differences among these estimates with regards to the expenditure components of GDP.



For the purposes of this Report, the data released by the United Nations Statistical Office is the source for most of the historical data for national income accounts. The advantage is that they provide a complete set of accounts by industrial origin for the period 1970-2007 at both current and 1990 constant market prices, along with a complete set of expenditure accounts. The complete UN accounts for selected years from 1970 through 2007 are set out in Annex Tables I.3 through I.6. For the purposes of this Report, the 1990 constant price accounts of the UN have been rebased to 2007.

SECTORAL COMPOSITION OF GDP

An important objective for the macroeconomic analysis in this Report is to link the sectoral sources of growth in the economy with the increased opportunities for employment that are generated by the Infrastructure Action Plan. To facilitate the analysis of employment trends, the UN national income accounts by industrial origin were decomposed in three areas:

- Agriculture, forestry and fisheries was split into commercial agriculture and all other agriculture. Government of Burundi national income accounts of several years ago include details for the various sub-sectors for primary industry activities. These data were useful in estimating the above breakdown for the past five years.
- In the industrial sector, mining and utilities were estimated separately. The UN accounts do not include separate estimates of value added for all components of the industrial sector. Manufacturing and construction are the only subsectors for which value added is reported. Estimates for the other two sub-sectors of interest for this Report, mining and utilities, were made in the following way. Value added for the power sector was obtained from the accounts of the power utility, REGIDESO. This was done by adding the cost of personnel to the EBITDA of the utility. Value added for the power sector was \$4.1 million in 2007, according to the accounts of the power utility. (See Annex Table VII.11 for these data.) No comparable data was found for water supply and sanitation, so total value added for utilities was adjusted to \$6 million for 2007.

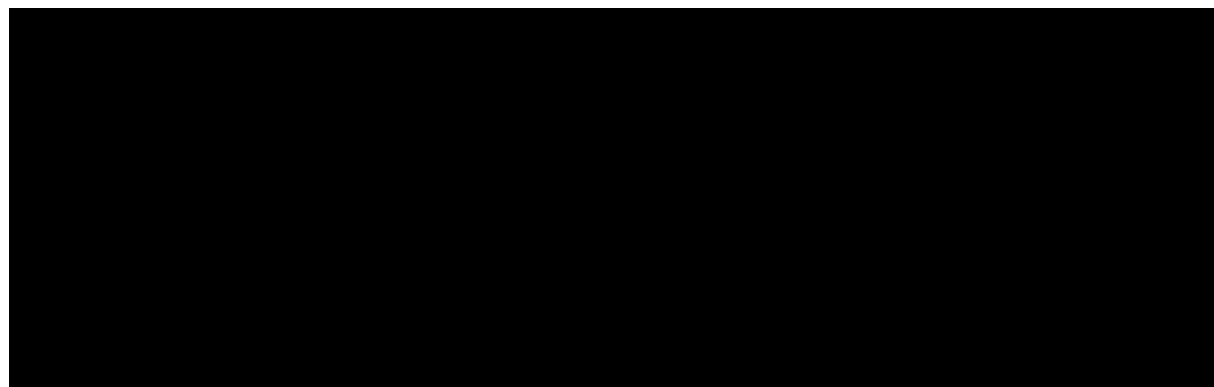
¹ See Departement de la Planification Centrale (2008), *Economie Burundaise 2007*. Republique du Burundi, Octobre 2008.

Value added for mining in 2007 was then derived as a residual, given that the UN accounts include the total value added for mining plus utilities.

- In the UN category called "other services," which includes public administration, financial services, property rental and management, tourism, and a variety of other services, public administration was separated out from this group. Public administration is separated out in the above-mentioned national income accounts of the government, but these data only go out to 2005. The personnel costs reported in the national budget were used as a proxy for estimating value added by the public sector for the past five years.

REVISION OF ESTIMATES OF GROSS INVESTMENT

There are substantial differences for particular years in the estimates of gross investment in these various sets of accounts. The trade statistics for imports of construction materials and capital equipment for Burundi were therefore used as a cross check on the estimates of gross investment in the national income accounts published by the UN. These trade data point to a substantial recovery in investment spending in Burundi in the past five years. The surge in these imports stemmed from increased donor outlays on infrastructure rehabilitation programs, and on a large investment in vehicles, including trucks, in the private sector.



The working assumption for these adjustments was that imports of construction materials and capital goods make up the bulk of expenditures on gross capital formation in Burundi. The main domestic expenditure is for labor. The labor component is assumed to be in the range of 10-20 percent of total expenditures on gross capital formation. As Table I.2 above indicates, there are several years in which imports of capital goods and construction materials are equal to or larger than expenditures on gross capital formation, as reported in the national income accounts of the UN, which suggests that investment expenditures may be underestimated in the UN national accounts. (These are 2001, 2004, 2005 and 2007.) For these years, it is assumed that domestic expenditures on capital formation are 15 percent of total outlays, which is close to the average for the unadjusted years in the Table. This assumption provided the basis for a revised set of estimates for gross investment in these four years, the results of which are reported in Annex Table I.2. These revised estimates for investment were incorporated into Annex Table I.5. Private consumption expenditures were then adjusted to balance the accounts.

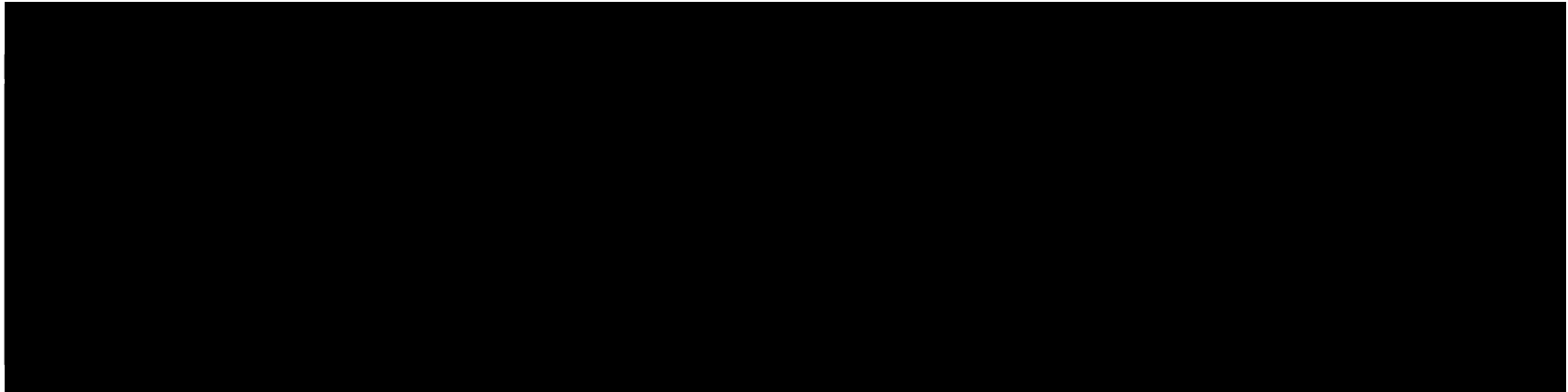
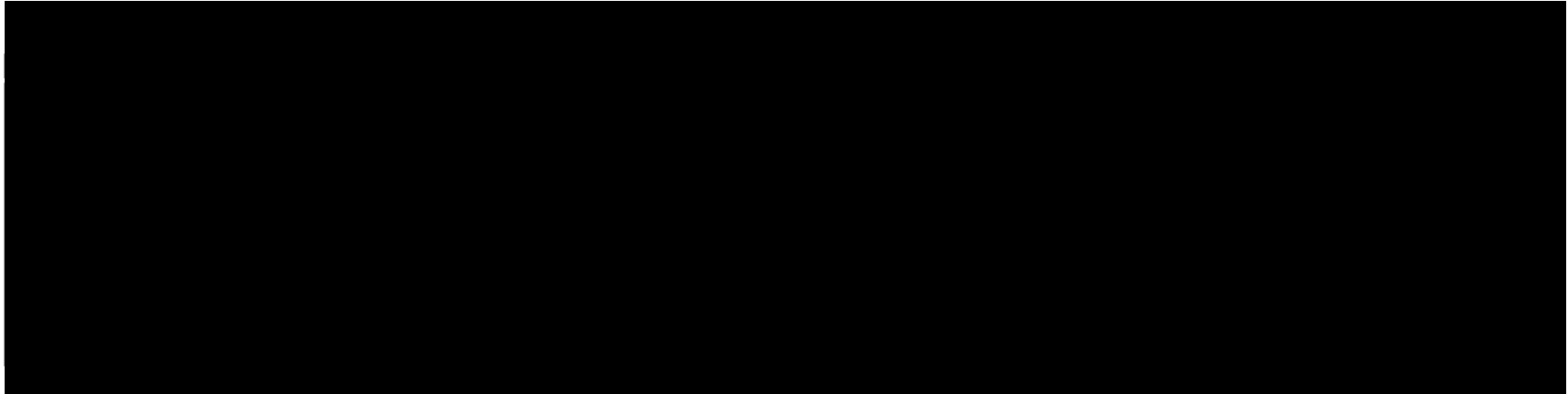
GDP ESTIMATES FOR 2008

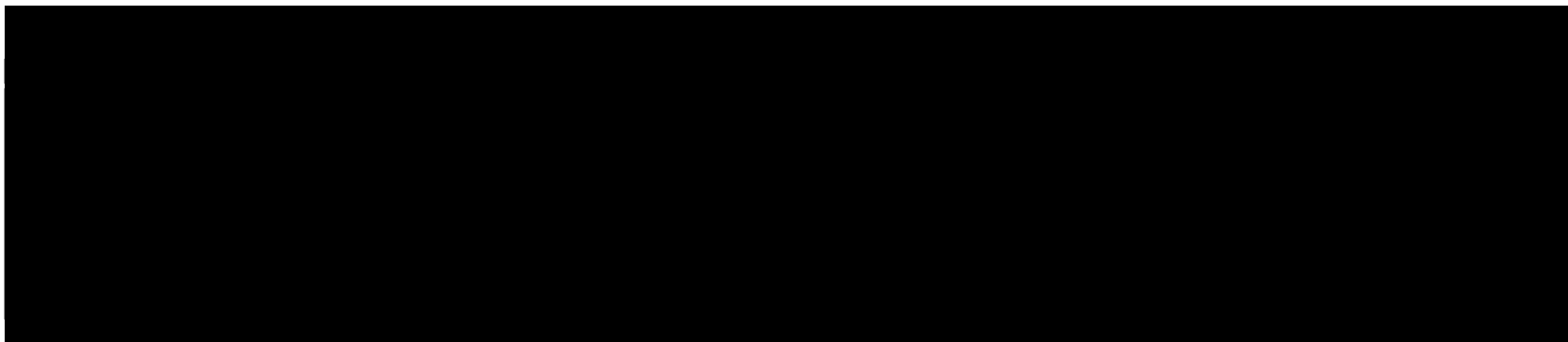
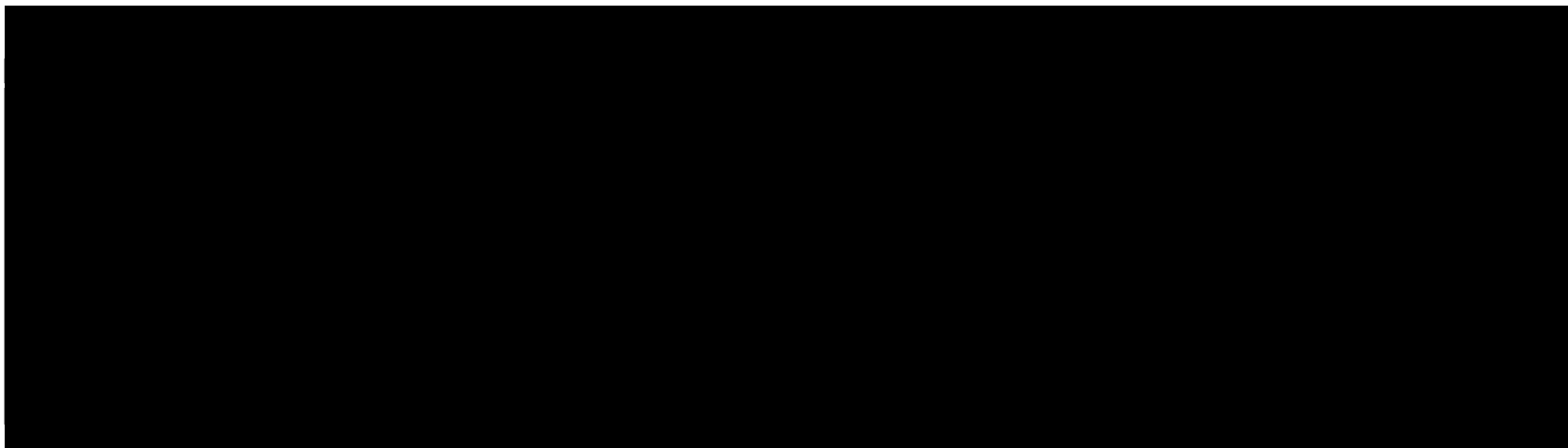
These tables also include estimates of national income accounts for 2008 that were prepared by the authors of the Report. The estimate for GDP for 2008 is based on the IMF's recent estimate that in real terms, GDP grew at 4.5 percent last year.² The GDP deflator was assumed to have increased by 24.5

² IMF (2009), *Enhanced Heavily Indebted Poor Countries (HIPC) Initiative Completion Point Document and Multilateral Debt Relief Initiative (MDRI)*. IMF Country Report No. 09/84, March 2009. It should be noted that in a

percent in 2008, consistent with the estimates made by the IMF. Estimates of GDP at current and constant prices were therefore derived and included in Annex Tables I.3 and I.4. UN data for the sectoral composition of GDP was used to derive estimates for each sector for 2008. Estimates for exports and imports in the national income expenditure accounts were based on trade data reported by the UN for 2008 (see Annex Tables IV.2 and IV.4. Gross investment was estimated from these import data for capital goods and construction materials, consistent with the above-described method used to revise historical data for gross investment. Public expenditure estimates were derived from budget data for the public sector as reported by the IMF. Private consumption was computed as a residual. IMF published data for net factor income in 2008 was used to estimate the national income for 2008.

recent publication, the African Development Bank estimated that GDP grew in real terms by 3.2 percent in 2008. See OECD and African Development Bank, *African Economic Outlook, 2009*. Paris, France, 2009.

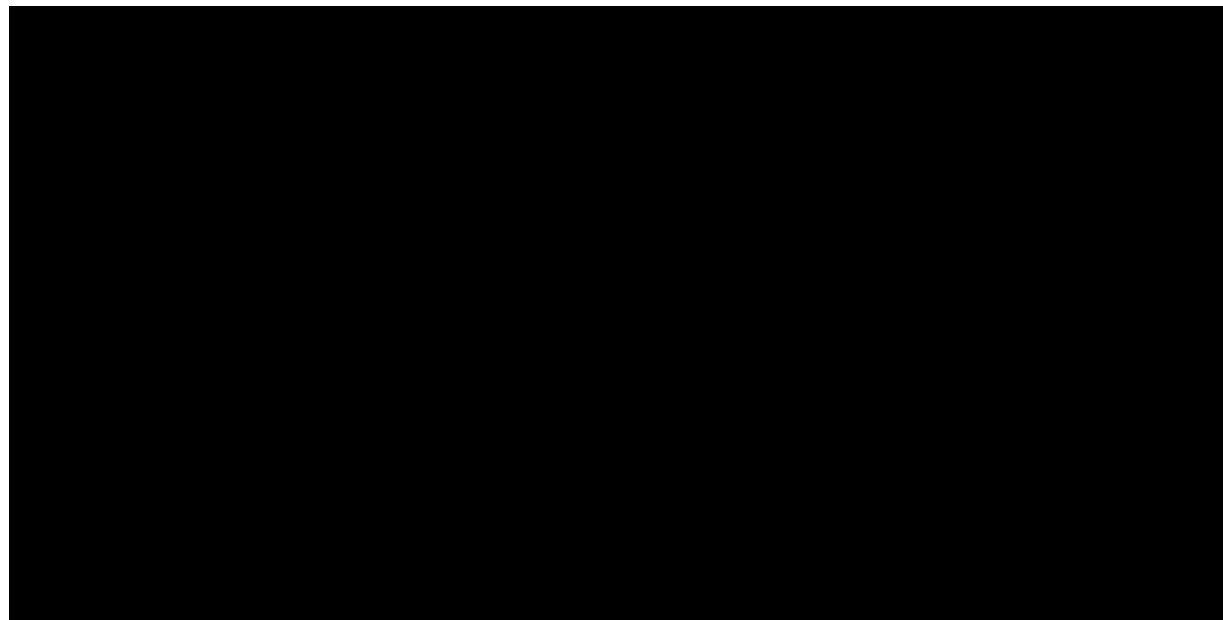




ANNEX II: POPULATION AND DEMOGRAPHIC CHARACTERISTICS OF BURUNDI

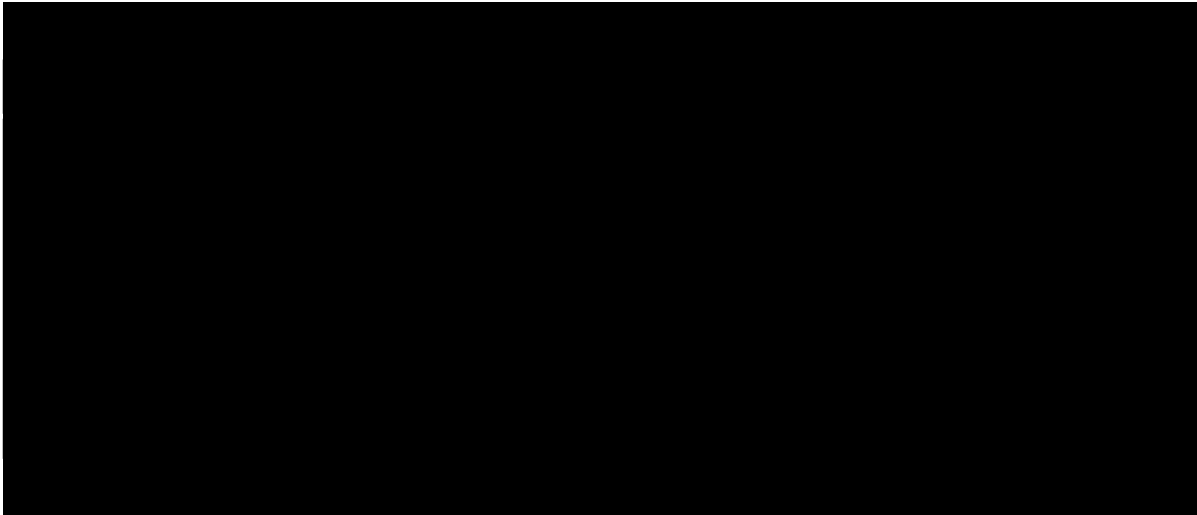
Provisional Results from 2008 Census. Various international organizations (including the World Bank, IMF and United Nations) have made estimates of Burundi's population for the past decade or so. There are significant differences among these estimates for particular years. The basis for the differences is not clear. For the purposes of this Report, the historical population data published by the United Nations have been used in combination with the preliminary results from the 2008 Census. The preliminary results of the population census for Burundi, undertaken in October 2008, were made available by the UNFPA office in Bujumbura. According to the census, the population was 8.039 million at the time of the census. When linked with the UN estimate of 6.47 million in 2000, this suggests an average population growth rate of about 2.75 percent a year during 2000-2008.

The preliminary Census results suggest important shifts in the demographic characteristics of the country, including an increase in population density from 165 persons per square km in 1990 to 233 in 2008. Annex Table II.1 provides a comparison of shifts in population since 2003 and the resulting changes in density. The provincial population data for 2003 are based on projections from the 1990 Census that were prepared by UNFPA in 2004.³ There have been outflows of population from six of the 17 provinces (Bubanza, Cibitoke and Ngozi in the north; Makamba in the south; and Gitega and Karuzi in the center of Burundi). The largest inflows of population have been in Bujumbura, Marie de Bujumbura, and Rutana. As Chapter 1 indicates, these shifts in population distribution and density in Burundi have potentially important implications for future planning of services, including infrastructure.



³ Although not fully consistent with the 2008 Census, the projection made in 2004 put the 2008 population at 8.119 million, which is only one percent higher than the preliminary Census number.

Population Projections. The analysis of future infrastructure requirements undertaken in this Report requires a detailed estimate of population growth for the period 2009-2030. The most detailed population projections are those published by the United Nations each year. The UN routinely prepares a number of different scenarios for each country, based on variations in key underlying assumptions about, for example, the total fertility of females of child-bearing age. Table II.2 below provides a summary for three of the variants prepared by the UN in 2008 for Burundi.

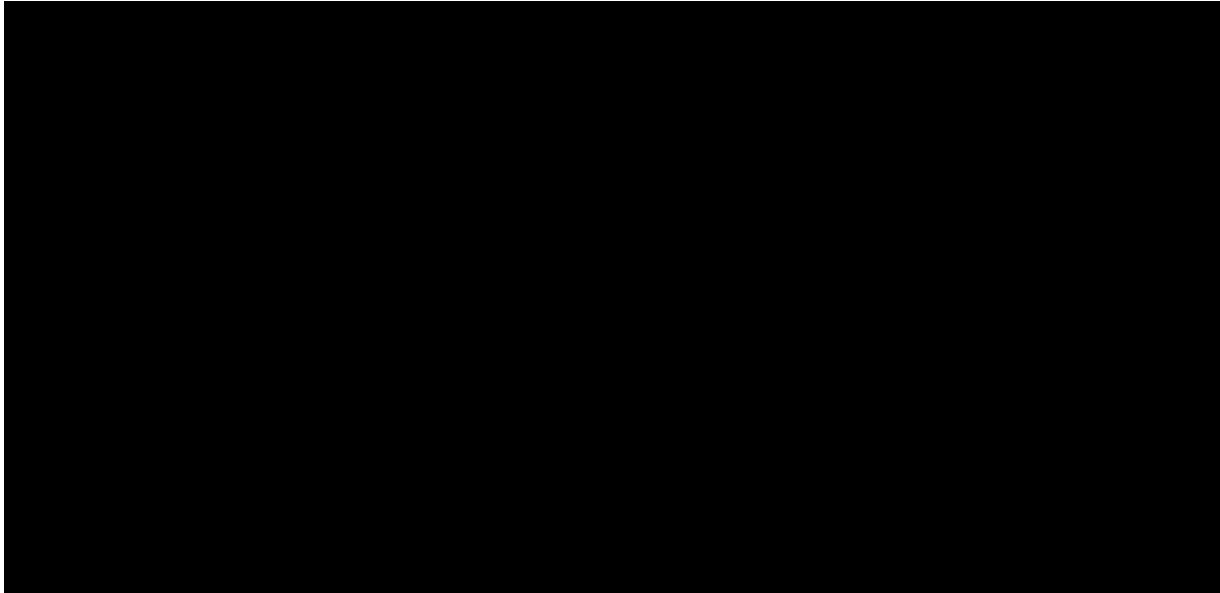


One disadvantage of these projections is that the assumptions used by the UN about total fertility of women of child-bearing age in Burundi at the present time are judged to be too low. Discussions with Government officials and UNFPA representatives in Burundi put total fertility in the range of 6.5 at the present time. The “Constant Fertility Rate” case of the UN, which has the highest fertility rate and population growth rate, assumes that total fertility remains unchanged at 4.66 from 2005 onwards. This variant gives a population growth rate of about 2.9 percent a year for the period 2005-2010, but total fertility then declines steadily to about 3 by 2030. As a result, population growth also declines steadily to 2.2 percent a year by 2030. The judgment of demographers familiar with Burundi is that population growth is likely to decline more slowly. For the purposes of this Report, rather than use the UN population projections for the “Constant Fertility Variant,” an independent estimate was made for this study. The results are summarized in Annex Table II.3 below in which the Burundi population is projected to be about 14 million by 2030.

Estimates for the urban and rural populations of Burundi are required for the formulation of the Action Program for Infrastructure, and especially for the electric power sector. There are various estimates available for the current urban population growth rate and population.⁴ For the purposes of this report, the urban population was put at 840,000 in 2008, which suggests an urbanization rate of about 10.5 percent in 2008. The urban population is thought to be growing at 6-7 percent a year at present. As Annex Table II.3 indicates, the growth in urban population is projected to slow gradually in the decade ahead and level off at about five percent a year by 2020. According to these projections, Burundi’s urban population would be about 2.6 million by 2030 – an increase of almost 2 million in two decades. These projections point to the importance of clear policies for Burundi regarding the spatial distribution of these population

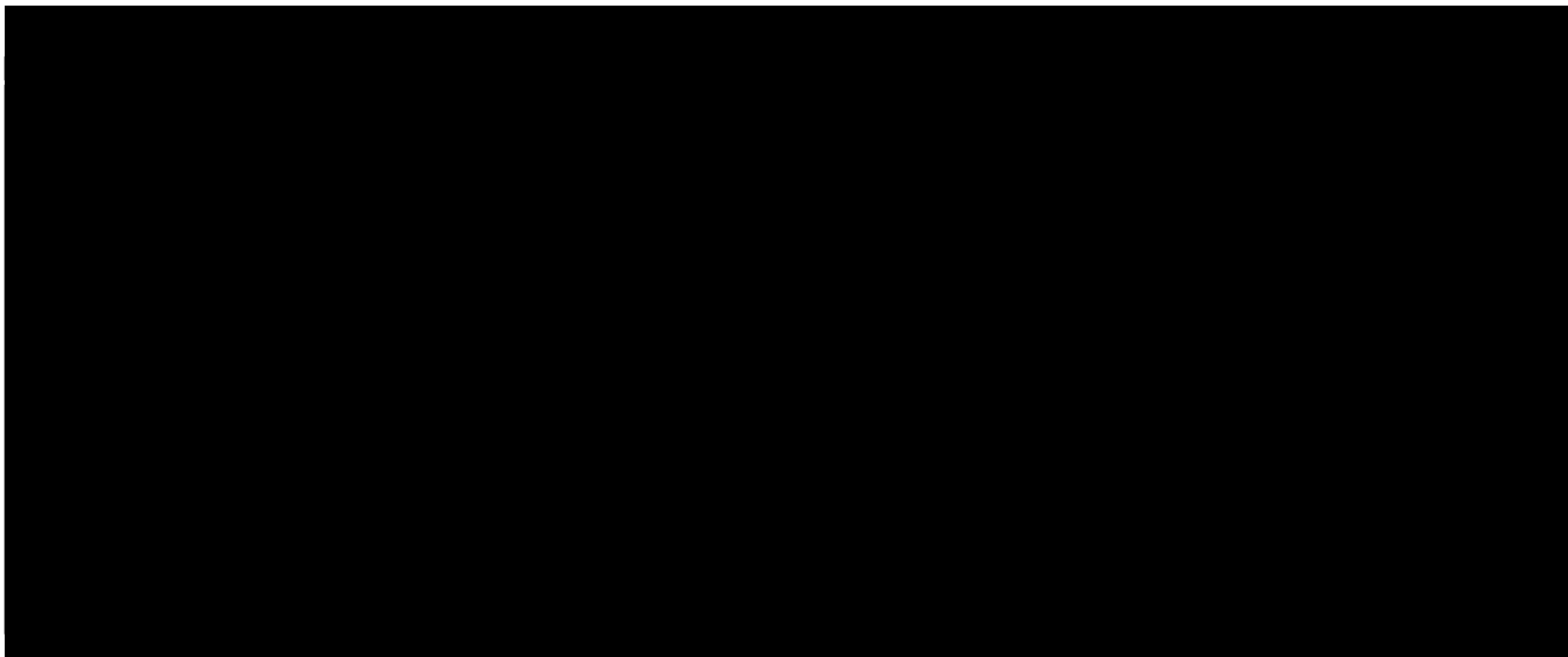
⁴ For example, the World Bank estimates urban population at about 800,000 in 2006 (an urbanization rate of 9.8 percent), while the African Development Bank estimates urban population at about 840,000 in 2008. See World Bank, *Africa Development Indicators, 2008/09*. The World Bank, Washington DC, December 2008; OECD and African Development Bank Group, *African Economic Outlook, 2009*. Paris, 2009.

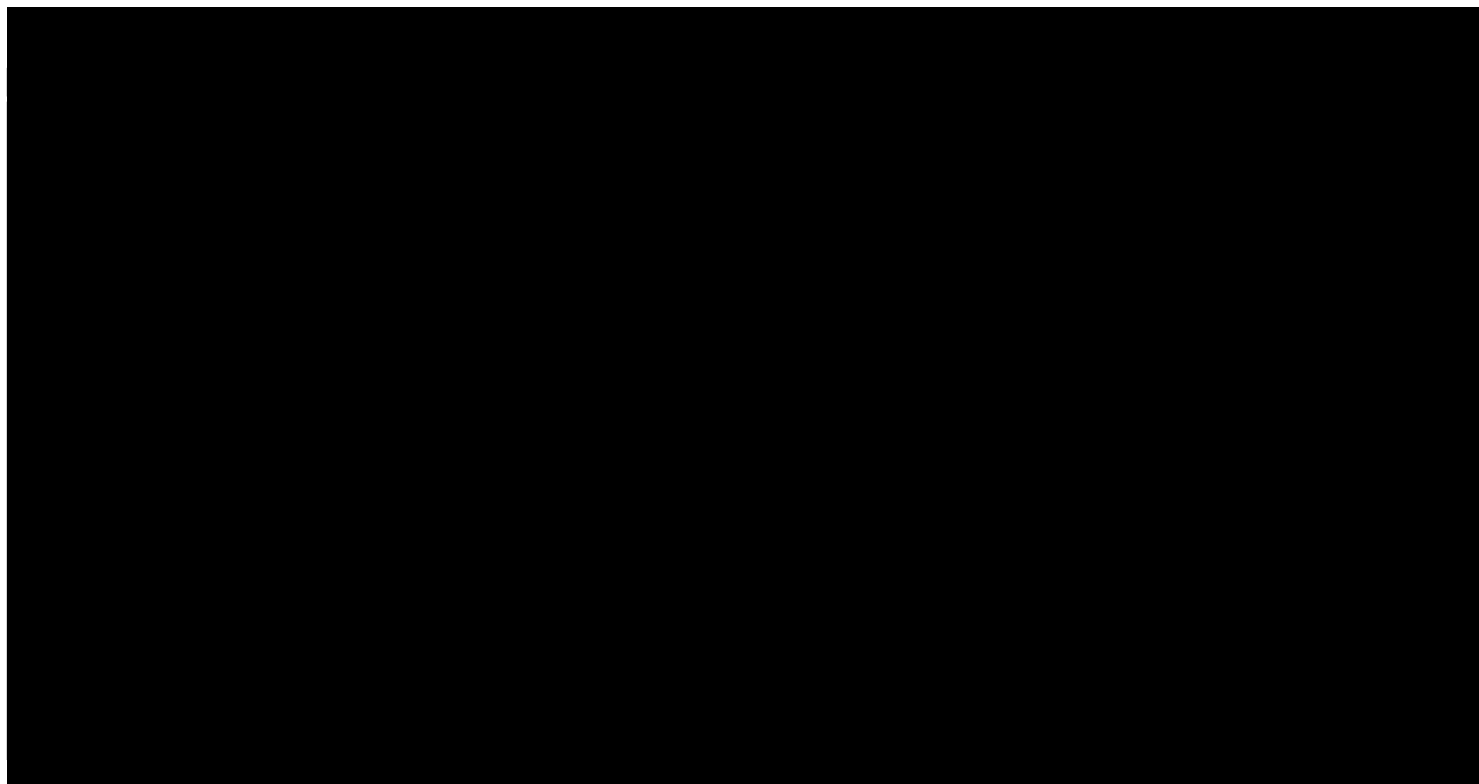
increases, if unmanaged internal migration to Bujumbura is to be avoided. Provision of basic infrastructure services in other towns and cities will be an essential part of such a strategy.



To facilitate analysis in this report on the future supply of electricity to households, estimates of urban and rural households were made using the foregoing population projections. Information about the average size of households was obtained from the 2006 household survey undertaken by the Government, which reported that the average size of households in 2006 was 5.5 persons in urban areas and 4.9 persons in rural areas.⁵ Assuming that these averages remain for the period up to 2030, the number of households in the country would increase from about 1.6 million at present to about 2.8 million by 2030 (Annex Table II.3). Urban households would increase from about 160,000 at present to about 500,000 by 2030. It is these demographics that underpin the analysis of infrastructure services and requirements presented in this report, including for example estimates for electrical connections to households.

⁵ See Republic of Burundi, *Enquete Quibb 2006: Rapport Final*. Ministere de la Planification du Developement et de la Reconstruction Nationale, Bujumbura, Juin 2006.





ANNEX III: LABOR FORCE AND EMPLOYMENT IN BURUNDI

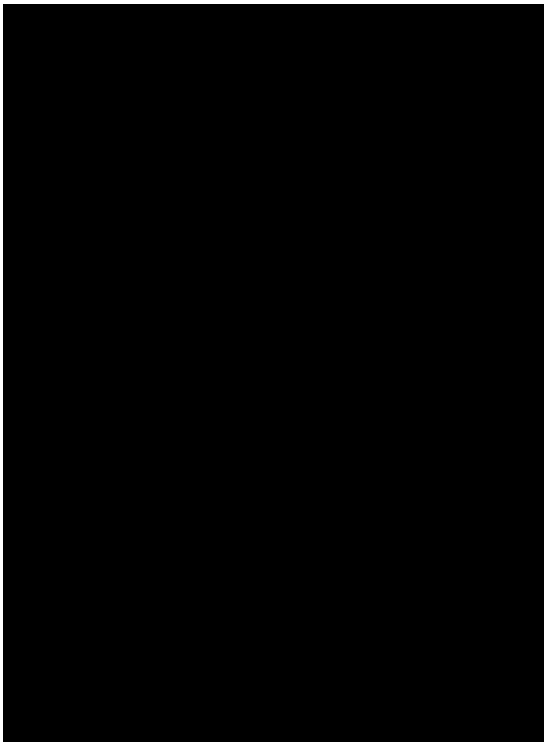
LABOR FORCE

For the purposes of this Report, and consistent with generally accepted international practice, the labor force is defined as all males and females in the population from ages 15 to 64 years who are employed or actively looking for employment. The estimated labor force for 1990-2008 and projections to 2030 is given in Annex Table III.1. The estimation of the labor force was derived in the following manner.

- The population in the 15-64 year age group is derived from the population data in Annex Table II.4 and UN Statistical Office data for the age structure of the Burundi population.
- Labor force participation rates for males and females were then applied to the above data for the 15-64 year age group. The historical estimates of labor force participation rates are based on data published by the World Bank in various editions of *World Development Indicators*. The projected participation rates assume a small decline over time as more teenagers, 15 years and above, remain in high school or go on to tertiary education.

ESTIMATES OF EMPLOYMENT

A rough estimate of the labor force employed and its sectoral composition was made for 2008. The estimate was made in the following way. The first step was to obtain an estimate of the labor force that was employed, so an unemployment rate was applied to the total labor force. There are no current data published for the open unemployment rate in Burundi. The African Development Bank (2009) reports an unemployment rate of 0.5 percent for 1990. It is not uncommon to find that reported open unemployment rates in low income developing countries are low. In these circumstances, a high percentage of the labor force is employed at least part time, but the under-employment rate is often very high. For the purposes of this Report, the open unemployment rate was assumed to be five percent.

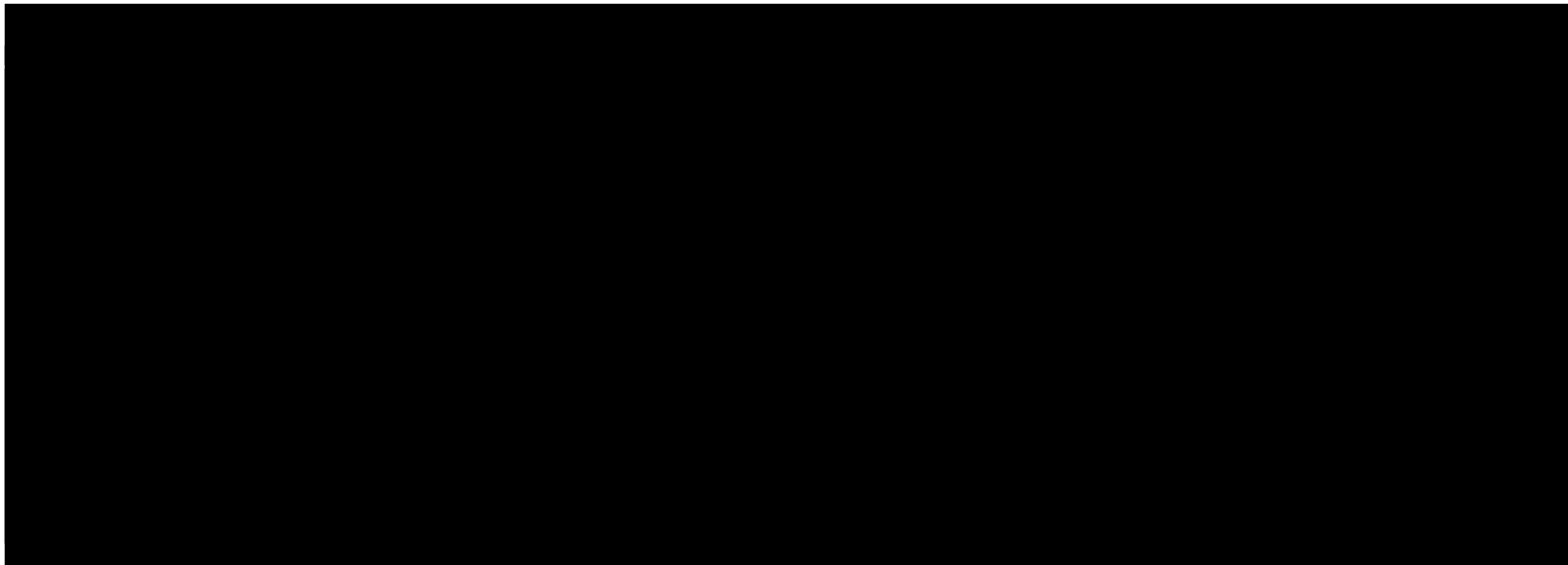
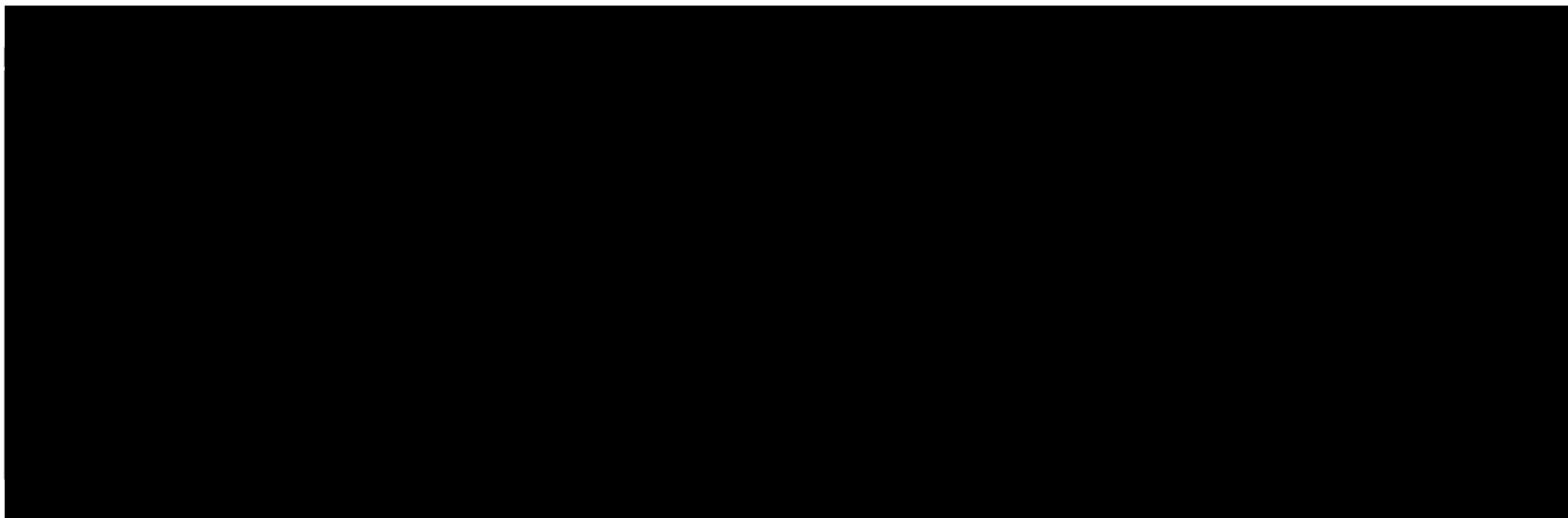


The next step was to estimate employment in agriculture. The World Bank (2008) reports value added per laborer in agriculture at \$80 for 2000-2002 at 2000 prices. On the assumption that average labor productivity has not changed significantly in the intervening period, this estimate was updated to \$95 in 2008 (at 2007 prices and exchange rates). This puts estimated employment in agriculture at about 3.55 million (Annex Table III.2). There are no up-to-date sources of information for employment in industry and services, so the assumption was made that value added per laborer in the services sector was moderately lower than in industry. The basis for this assumption was that the services sector has a large number of people in part-time low productivity activities, whereas employment in manufacturing, the most important component of value added in industry, has somewhat higher value added per laborer due to wage employment in the state enterprises and other formal business establishments. Given the assumptions for value added per laborer for the industry and services sectors, as reported in Annex Table III.2, the total employment in these two sectors was calculated from the estimates of value added in Annex I.

This procedure suggests about 130,000 people were employed in industrial activities in 2008, mainly in mining, manufacturing, handicrafts, and construction activities. A separate estimate of the person years of employment in mining was made by assuming that value added per laborer was somewhat higher than for agriculture. This was put at \$150 for 2008 (at 2007 constant prices), which suggested that the mining sector accounted for about 34,000 person years of employment in 2008. This compares with the 50,000 artisanal workers involved in alluvial gold mining, as discussed in Chapter 2. Since not all of these workers would be employed year round in gold mining, the above estimate of 34,000 was judged to be a useable estimate for employment in mining. Employment in the services sector was therefore residually determined at about 330,000.

The base year employment numbers for 2008 were then used to develop projections of employment for the Base Case Scenario outlined in Chapter 4, and for the five alternative scenarios considered in this Report. (See Table 3.1 for a description of these scenarios.) Assumptions were made about the annual growth of value added per laborer for the industry and services sectors, as reported in Annex Table III.2 above. Given that the simple macroeconomic model described in Annex VI generates estimates of total value added for each sector, the projected values for employment in industry and services are calculated from total value added for each sector given by the model and the projected levels of value added per laborer. In the particular case of the Musongati nickel mining project, it is assumed that once the mine is operational in 2017, total direct employment by the mining company would be 3,000 -- a level of employment that is consistent with other large mining operations around the world. The amount of employment in agriculture is derived as the difference between total employment and the estimates for employment for industry and services generated by the model. Given that the macroeconomic model projects value added in agriculture, value added per laborer is then obtained for agriculture as a residual.

Annex Table III.3 sets out projected values to 2030 for the Base Case Scenario for value added, total employment and value added per laborer for the agriculture, mining, non-mining industry, and services sectors.

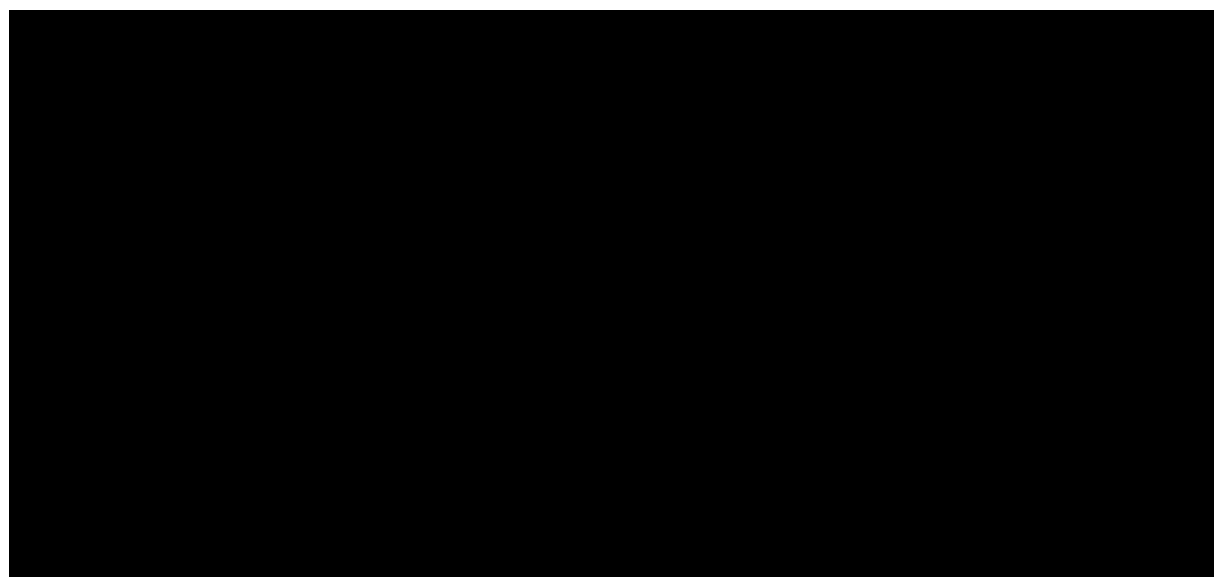


ANNEX IV: INTERNATIONAL TRADE STATISTICS FOR BURUNDI

As with other statistics for Burundi, there are substantial differences among some of the standard sources for the annual value of Burundi's merchandise exports and imports. These sources include:

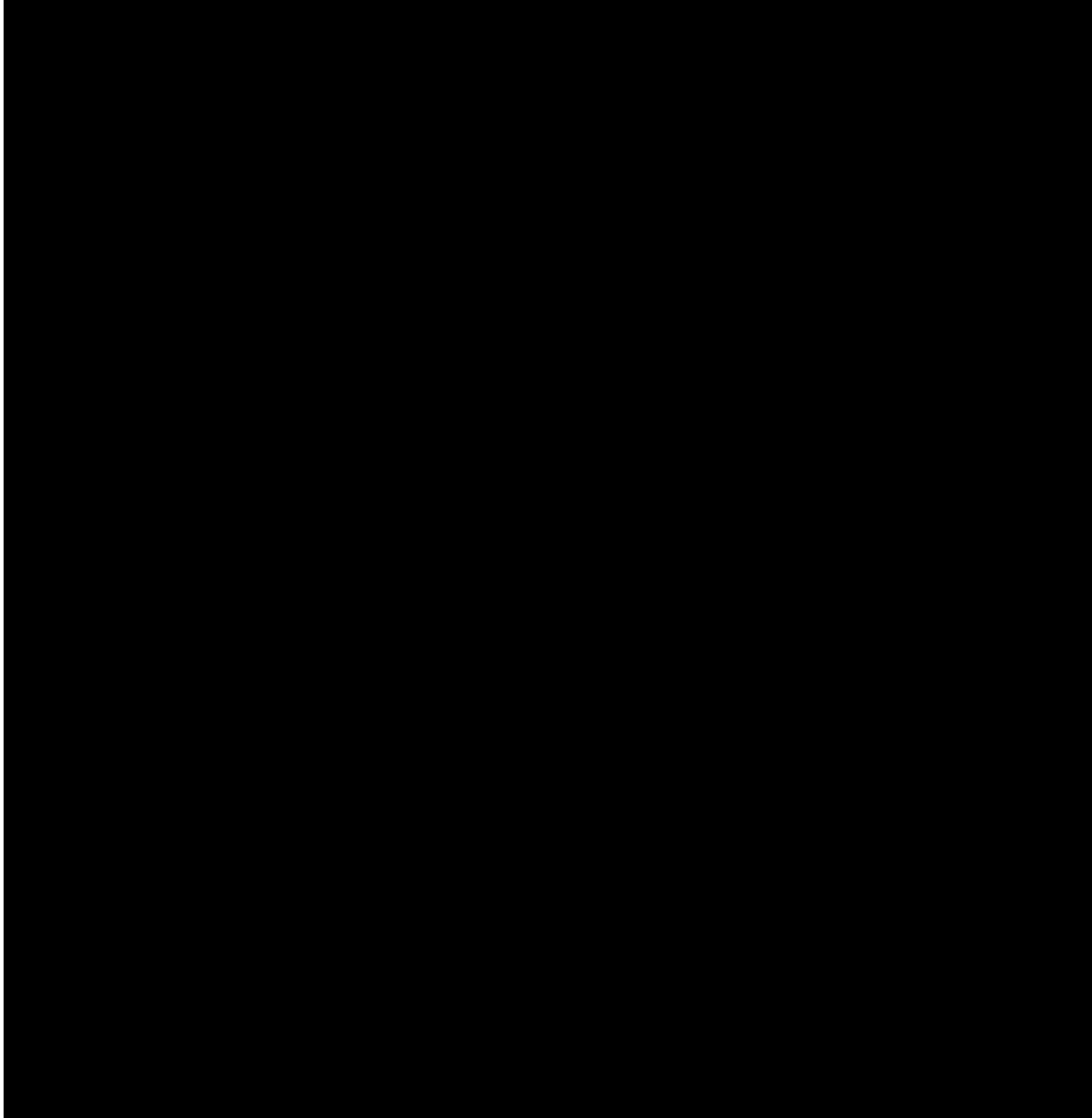
- The United Nations Commodity Trade Statistics Database (COMTRADE), which is the primary source for the commodity trade statistics used in this Report. These COMTRADE data are set out below in Annex Tables IV.2 through IV.6.
- The Central Bank of Burundi.
- The International Monetary Fund *International Financial Statistics*, which is published monthly by the IMF.
- The International Monetary Fund *Direction of Trade Statistics*, which is published quarterly by the IMF.

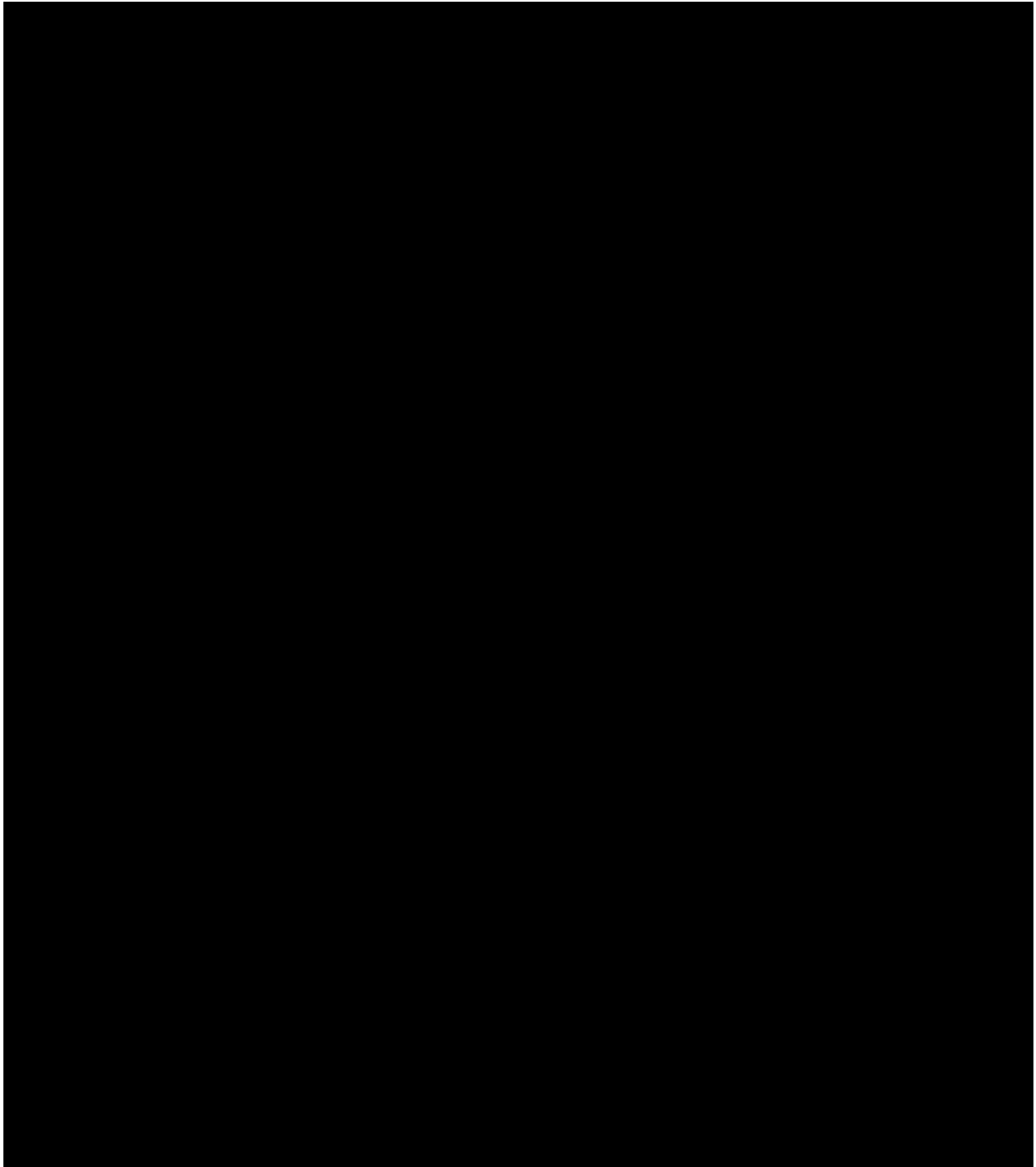
Annex Table IV.1 sets out recent values for exports and imports as reported by these various sources. The COMTRADE data for exports reported for Burundi has been substantially higher than the other sources since 2003. The main reason for this difference is the exports of non-monetary gold reported by Burundi. According to the COMTRADE database, these exports have gone to the United Arab Emirates, Switzerland, Belgium, Kenya, Ethiopia and Saint Helena in various years. The COMTRADE export receipts net of non-monetary gold, are roughly comparable to the Central Bank (and IFS) data for 2000 through 2006. The former are substantially larger in 2007 and 2008, but are comparable to the export data reported by the Direction of Trade database of the IMF. There are significant differences for some of the earlier years as well; for example, the value of tea production and associated exports reported by the Central Bank of Burundi and the Bujumbura Port Authority are larger than that reported in the UN database. The export data reported in the IFS is the same as that reported by the Central Bank of Burundi for all years from 2000 through 2008. In addition, in preparation for the forthcoming Burundi Country Economic Memorandum, the World Bank has extracted from the COMTRADE database, the value of Burundi's exports as reported by their trade partners. These also differ from the various other sources.

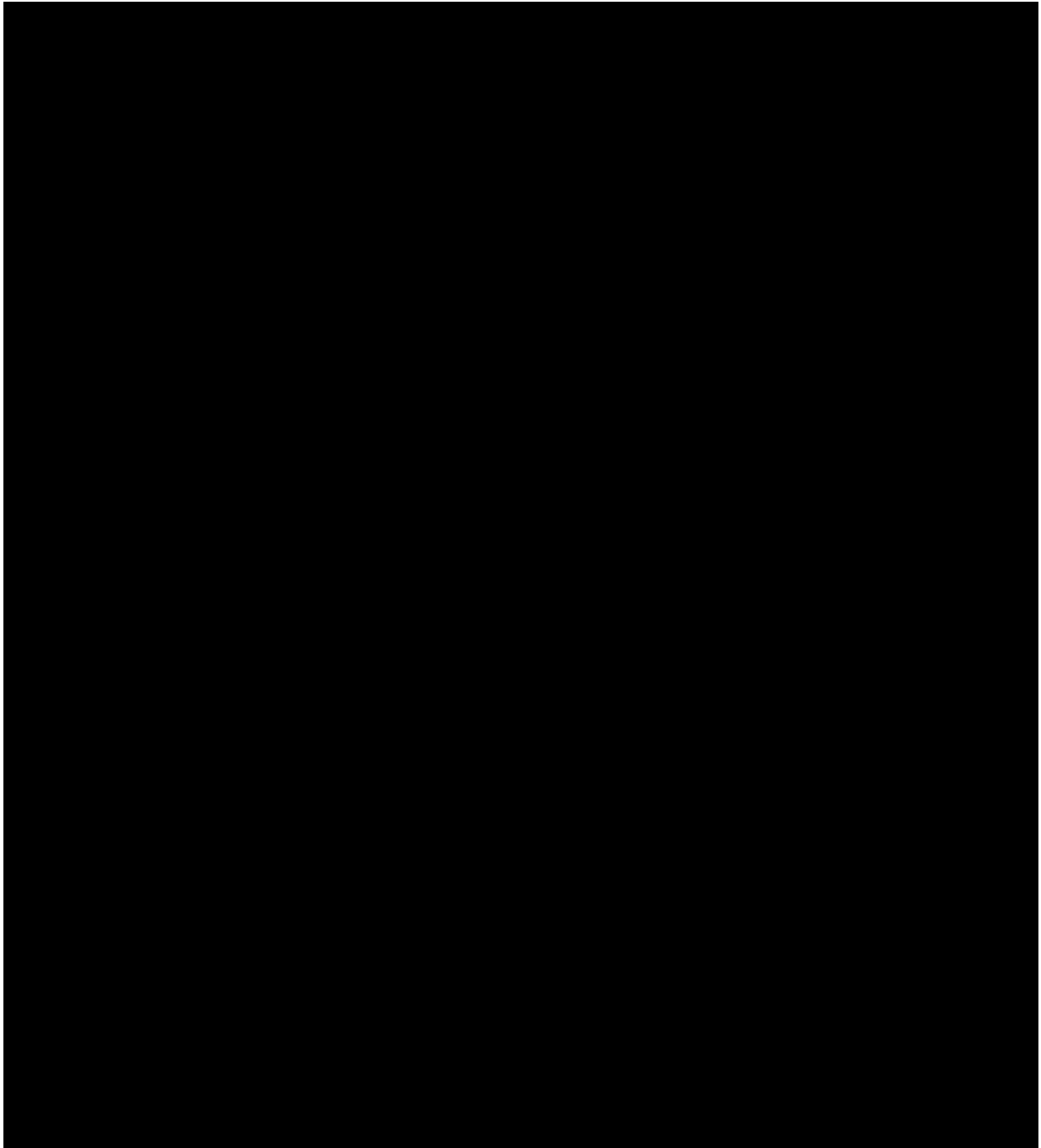


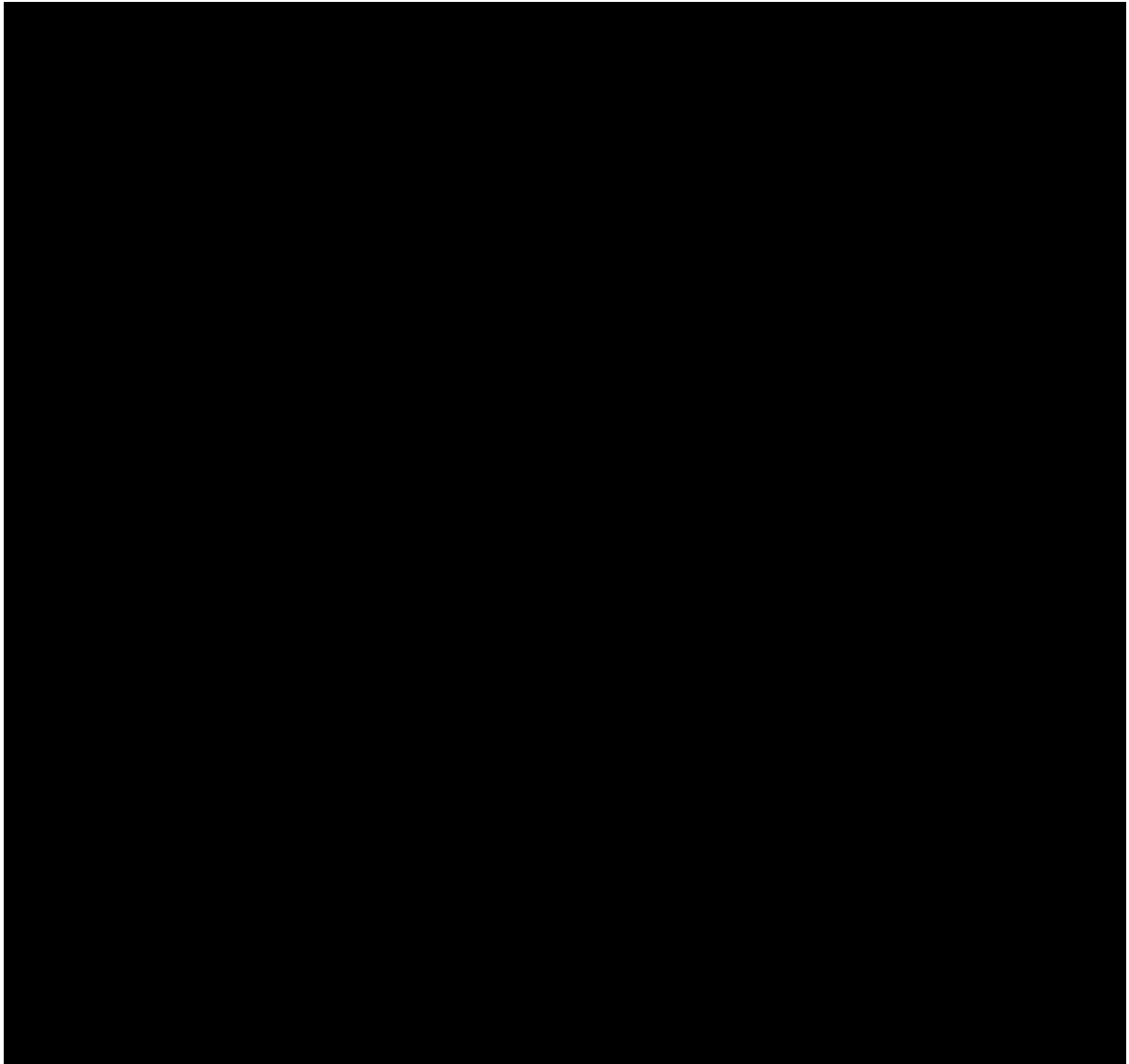
In the case of merchandise imports, several entries for imports that stand out in the COMTRADE data. One is the import of \$59 million of beverages in 2006 in contrast to levels of about \$1 million a year in

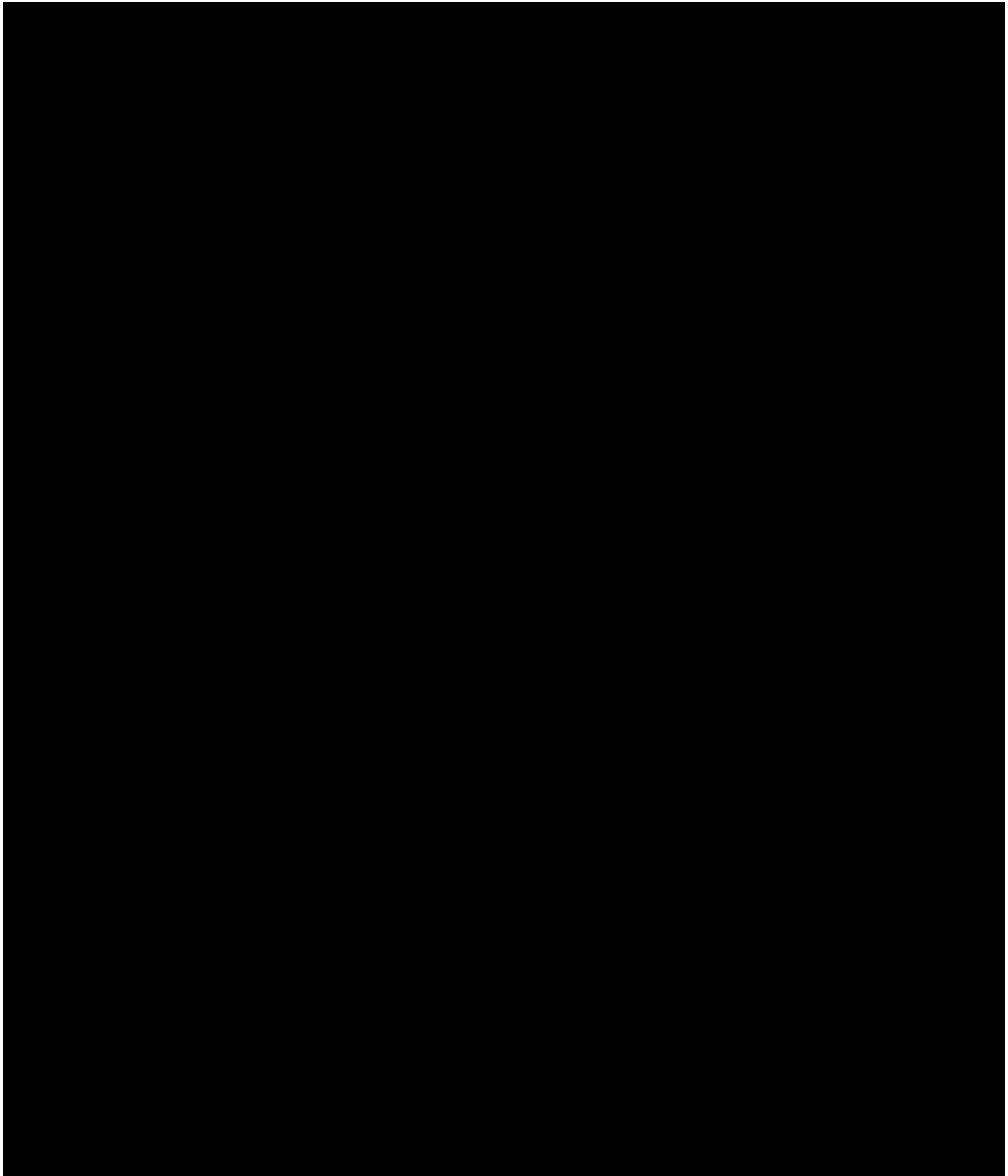
other recent years. Other items are the import of \$18 million of ferrous metals in 2006 and \$21 million of railway/tramway equipment in 2006. Nonetheless, the differences between imports reported by the UN and the IMF are smaller than for exports. The IFS data differ from that of the Central Bank for 2000 through 2003, but these data are the same for 2004 through 2008.

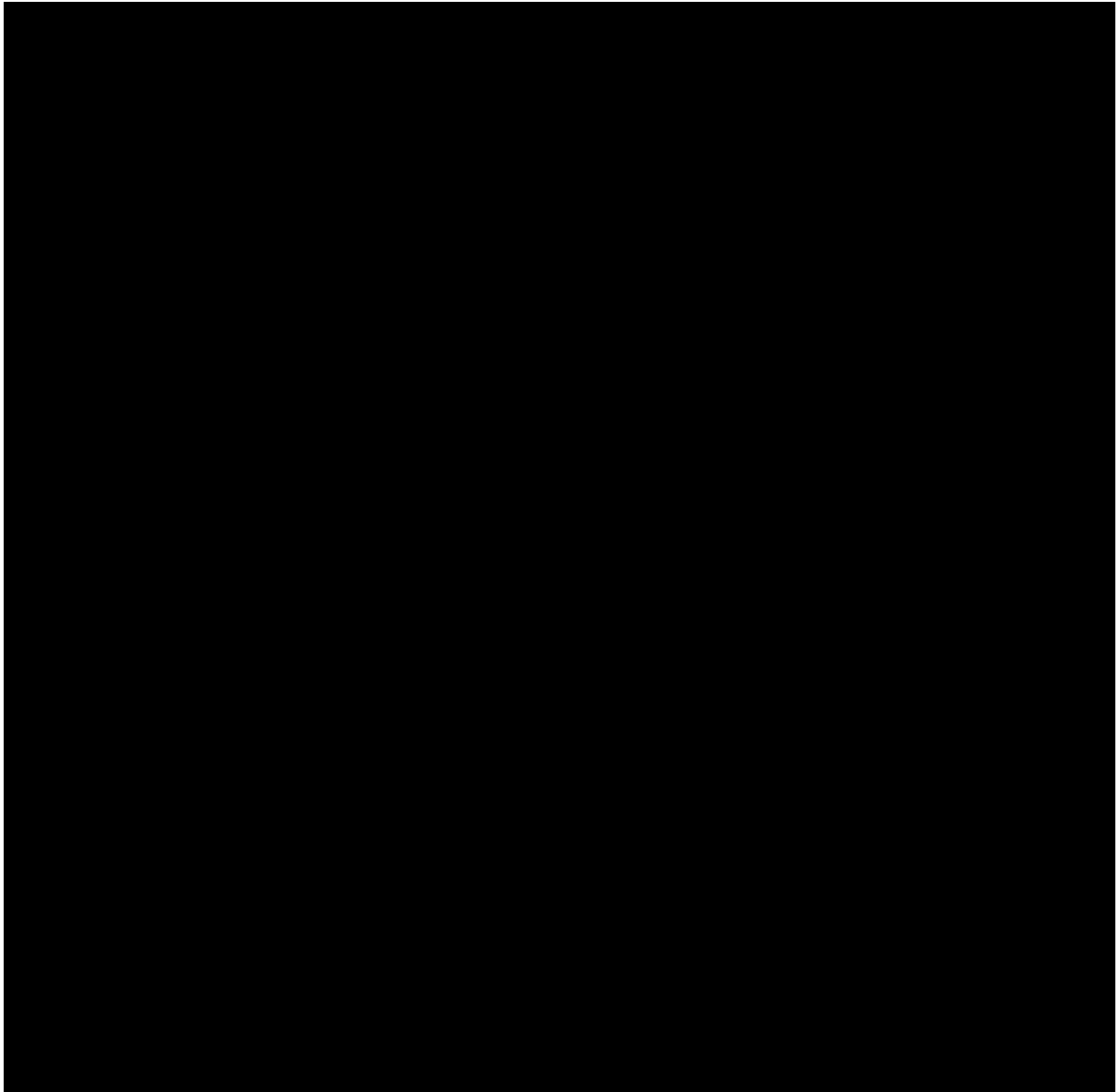


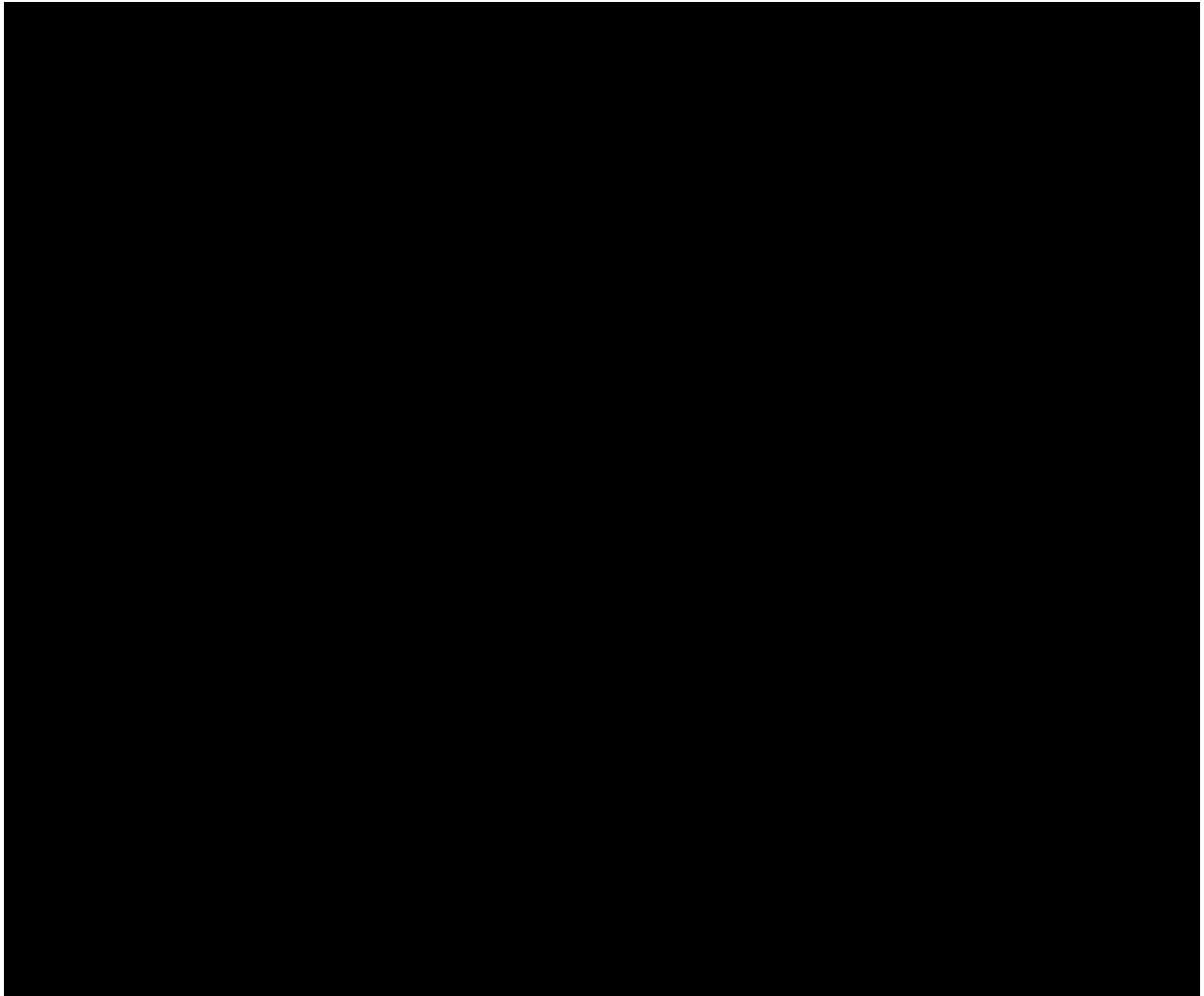


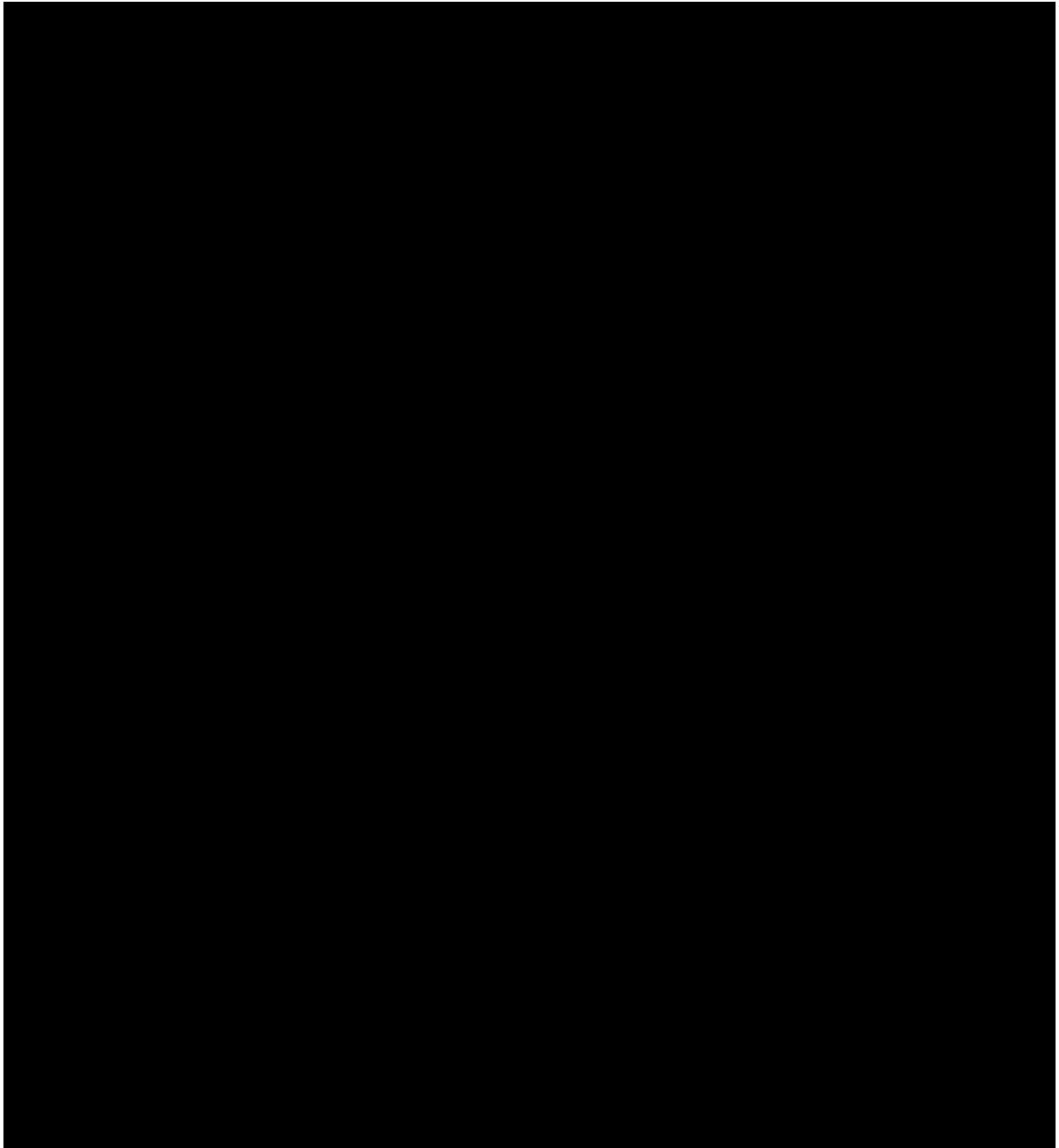


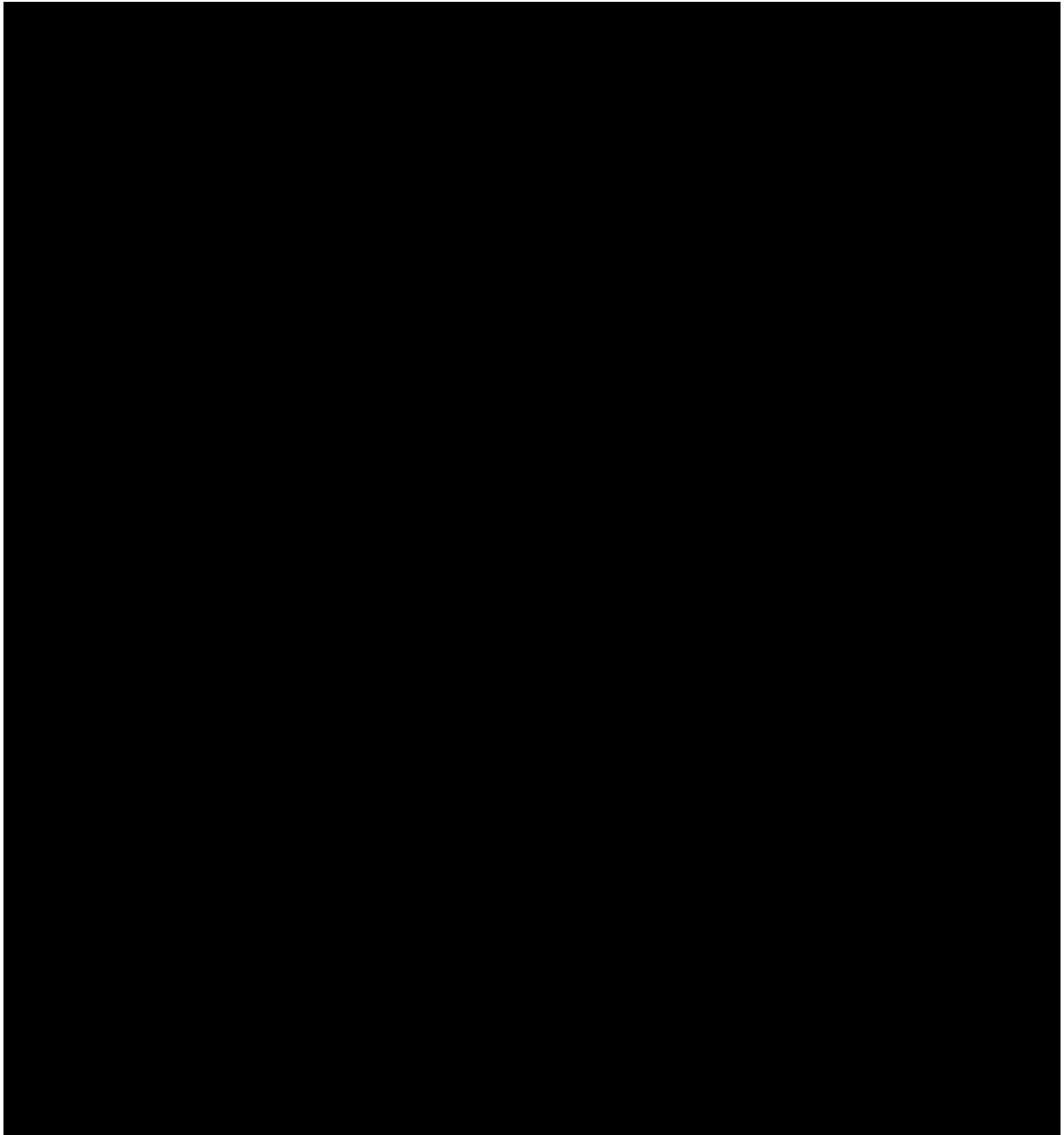


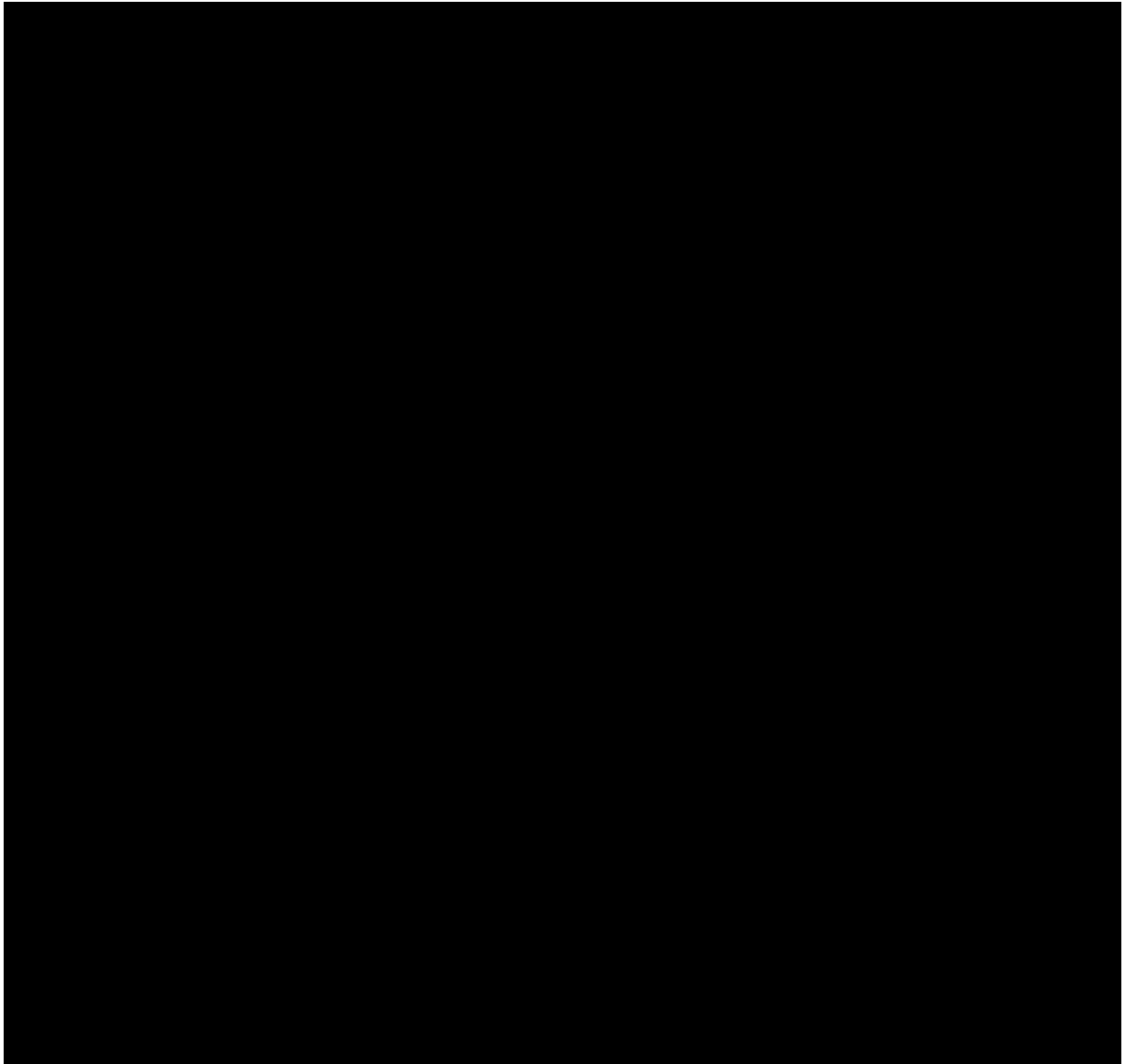


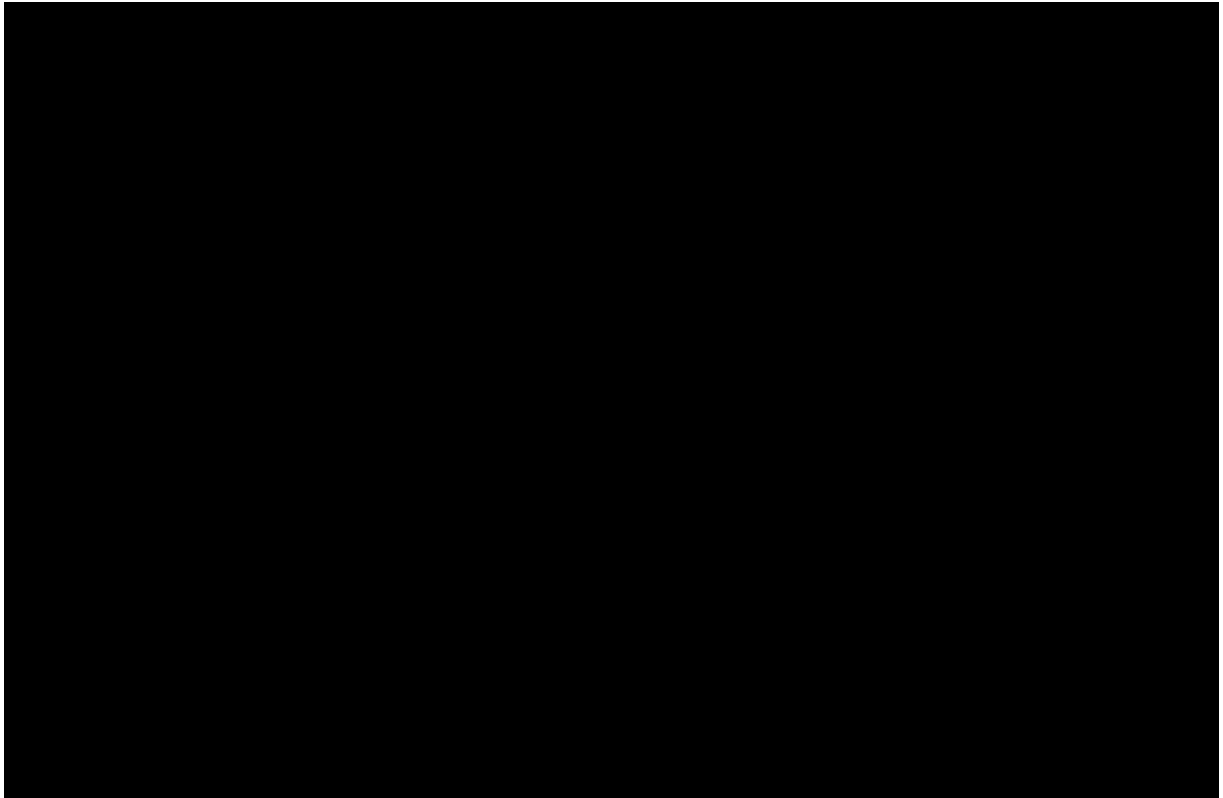










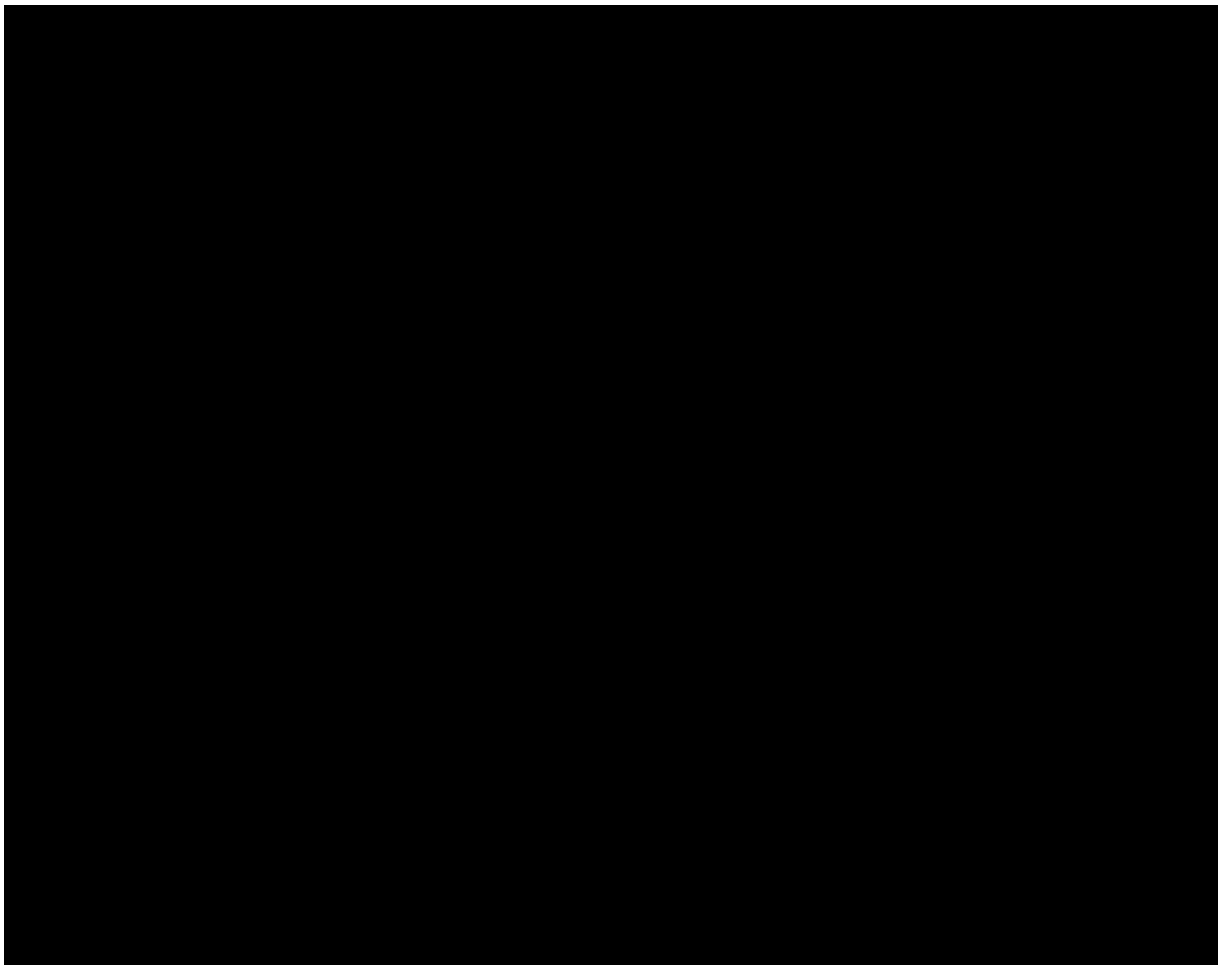


ANNEX V: ESTIMATION OF INTERNATIONAL FREIGHT MOVEMENTS TO AND FROM BURUNDI

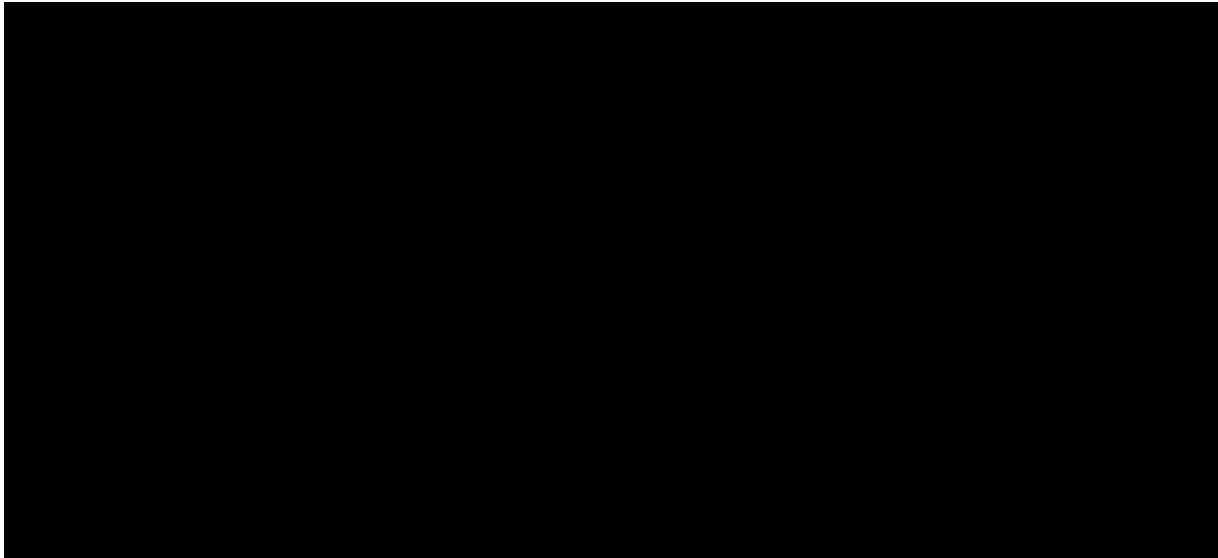
The estimation of the volume of international freight into and out of Burundi in recent years was built up from various data sources, including reports on Burundi's exports and imports passing through the Ports of Mombasa, Dar es Salaam, road and lake vessel traffic reported by the Bujumbura Port Authority, quantities of exports and imports reported by the Central Bank of Burundi, and air traffic reported by the Civil Aviation Authority.

HISTORICAL DATA ON INTERNATIONAL TRADE FLOWS

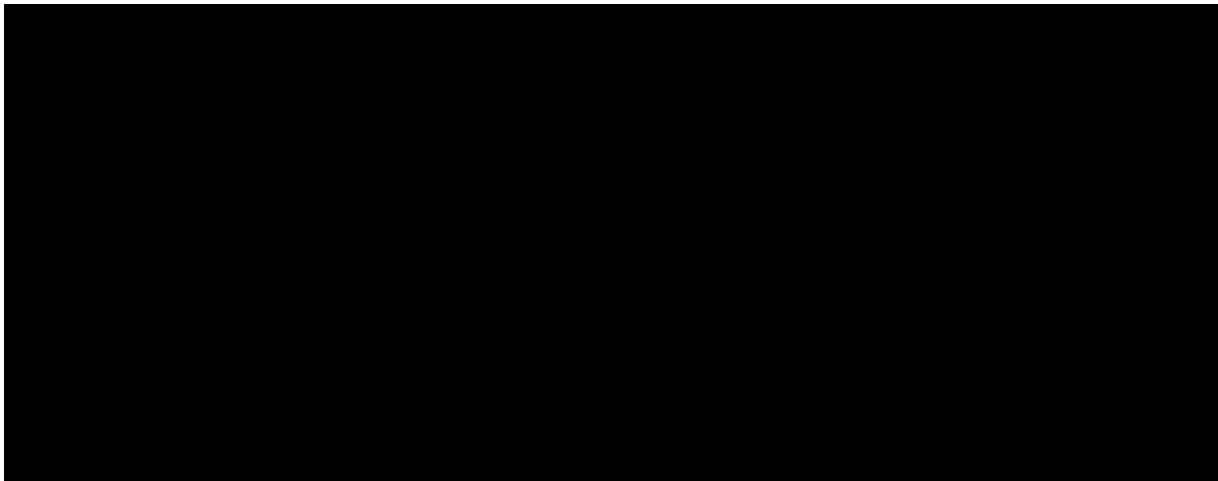
Annex Table V.1 reports on the information provided by the Bujumbura Port Authority on the total volume of exports and imports into and out of Burundi during 2000-2008. These data point to a sharp decline in the total volume of imports and exports over the past nine years. These trends in volumes are not consistent with trends in values of imports and exports as outlined in Annex IV above. Anecdotal evidence suggests that the volumes of freight carried by lake vessels may be reasonably accurate, but the volumes carried by road are underestimated.



The Railways Traffic Study prepared by CPCS Transcom International Limited includes information on volumes of Burundi exports and imports that passed through the Ports of Mombasa and Dar es Salaam. These data are the source for the information contained in Annex Table V.2. The data for 2002, 2005 and 2006 for Dar es Salaam were estimated from the information contained in the CPCS report. The data for 2007 and 2008 were estimated using information in Annex Table V.1 and values of exports and imports reported in Annex Table IV.1, Annex Table IV.2 and Annex Table IV.3. The important point that emerges from these data is that the total volume exports and imports passing through these two ports is substantially larger than the total quantities of exports and imports reported by the Bujumbura Port Authority.



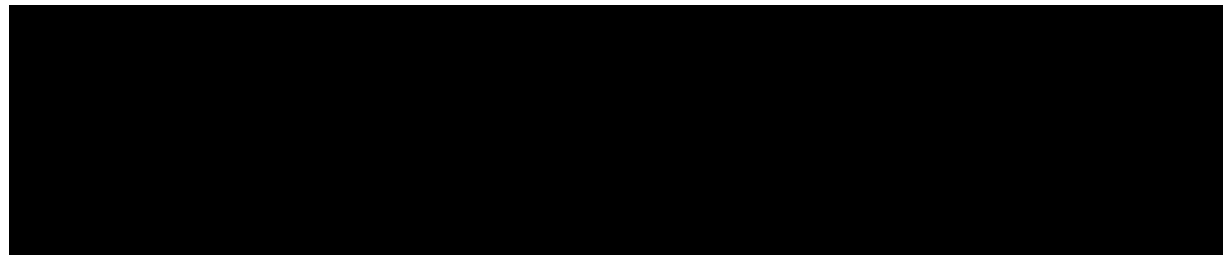
Annex Table V.3 reports the freight and passenger traffic that passed through the Bujumbura International airport during 2000-2008.



PROJECTION OF INTERNATIONAL TRADE FLOWS

Annex Table V.4 includes estimates of export volumes for the period 2004-2008 and projections to 2030. Total export volumes for 2008 are estimated at about 33,000 tons, consisting mainly of coffee, tea, hides,

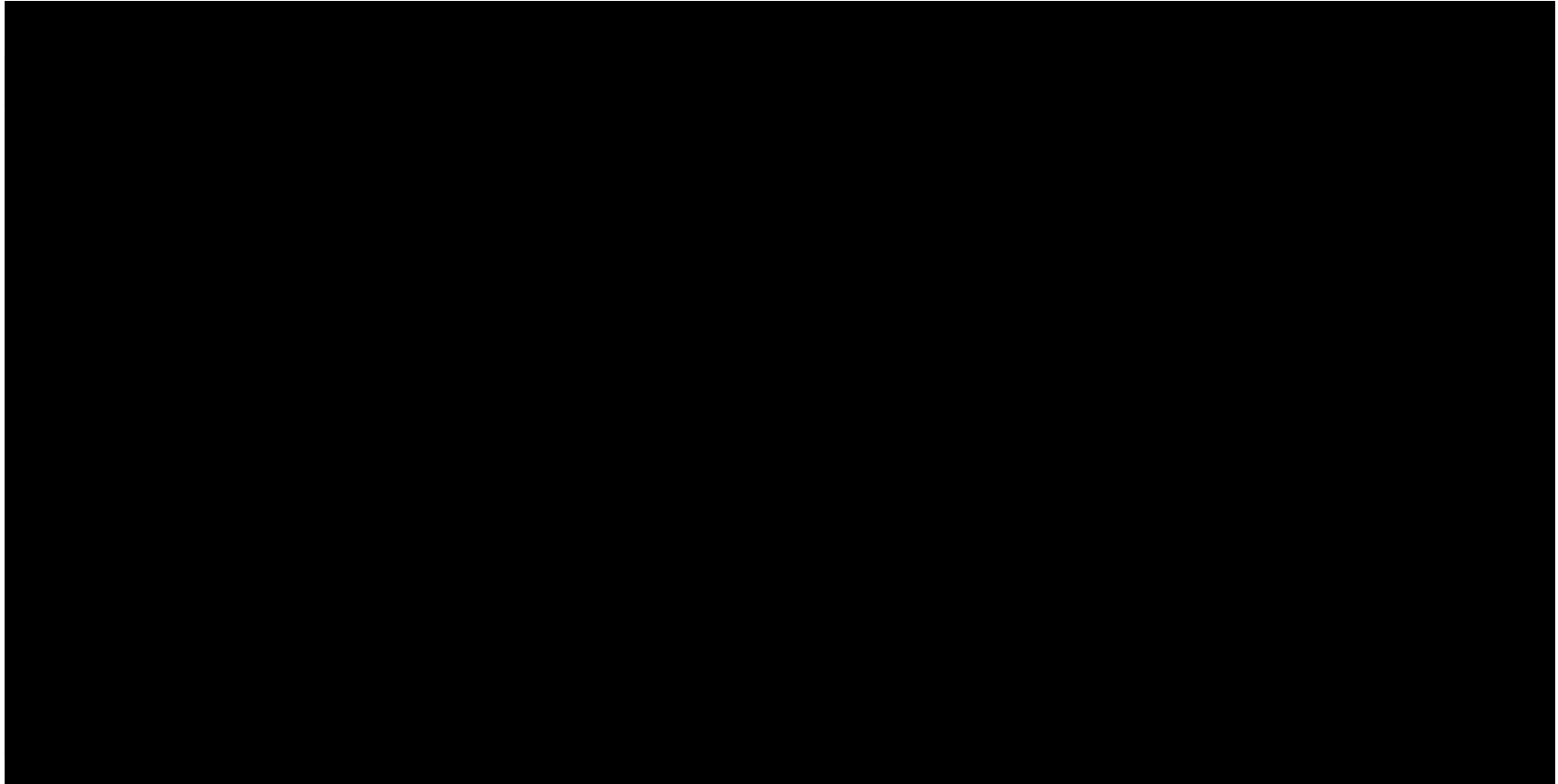
scrap metal and miscellaneous other items. For the Base Case Scenario outlined in Chapters 3 and 4, total export volumes are projected to be close to 200,000 tons by 2030. This includes some 54,000 of nickel and cobalt exports from the proposed mining operation in Musongati. As the discussion in Chapter 2 indicates, the bulk of the non-mineral exports are assumed to be agricultural products, including an increasing range of processed products and high value items destined for niche markets that are air-freighted from Burundi. With the improvements to the International Airport in Bujumbura, high value exports that are air-freighted to European and Middle East markets are assumed to grow at an average of 20 percent a year, with the bulk of the growth coming after 2015, at which time the upgrade of the airport facilities would be well advanced. It is assumed that there would be a gradual recovery in exports that go to Dar es Salaam by some combination of lake vessel and rail, but the bulk of the agricultural exports would continue to go to Kenya on the Northern Road Corridor for shipment from Mombasa.



Annex Table V.5 sets out the projections of imports into Burundi that were prepared for this Report. Total imports, other than petroleum products, are estimated at about 250,000 tons a year at the present time. These are projected to grow to about two million tons by 2030. According to Central Bank data, fuel imports for the transport sector, which are the most important category of petroleum imports, were about 61,000 tons in 2008. Given the projected growth for the transport sector, fuel imports are projected to rise to about 600,000 tons by 2030.

The underlying assumptions for these projections are as follows:

- Total imports through the ports of Mombasa and Dar es Salaam are assumed to grow by eight percent a year during 2009-2030. In this period, GDP in real terms is projected to grow at 7.1 percent a year in the Base Case Scenario, which implies an import multiplier of 1.1. The share of these imports that pass through the Port of Mombasa is assumed to rise to 42 percent by 2010 because of slow progress in improving the performance of the Tanzanian rail services and in increasing the capacities of the Port of Dar es Salaam. As a result, an increasing share of these imports pass through Mombasa.
- Imports that arrive by air are assumed to grow at 15 percent a year as a result of: (i) steady growth in passenger traffic and hence baggage; and (ii) increased use of airfreight services once the International Airport at Bujumbura is in full compliance with ICAO and EAC standards. As the discussion in Chapter 7 indicates, the target date for achieving this objective is 2014.
- Other imports by road from Sub-Saharan African countries are assumed to grow at eight percent a year - the same as the growth rate assumed for imports through the ports of Mombasa and Dar es Salaam.



ANNEX VI: MACROECONOMIC PROJECTIONS FOR BURUNDI

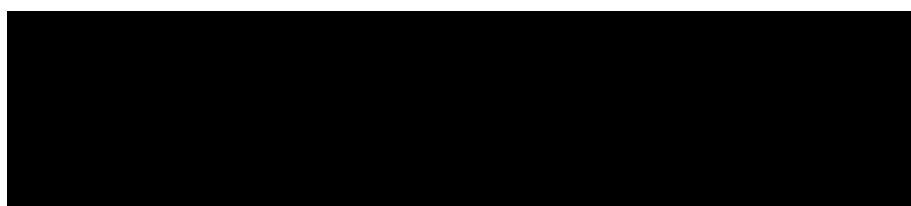
METHOD OF CALCULATION

For the purposes of this Report, a simple procedure was used to make projections of the national income accounts and its sectoral components. All projections have been made in US dollars at constant 2007 prices and exchange rate. The sequence of steps involved was as follows:

1. Incremental capital output ratios (ICORs) were projected for the period 2009 through 2030.⁶ Assumptions about these projected values of ICORs drew on an analysis of the historical ICORs for Burundi, as discussed below.
2. The levels of public and private investment (at constant 2007 prices) were then projected for the period 2009 through 2030, drawing extensively on the detailed analysis of investment required included throughout this Report.
3. The value of GDP at constant 2007 prices was then derived from the projected level of investment and ICORs using the standard formula for an ICOR.
4. Growth multipliers for each sectoral component were then applied to the GDP growth rate to obtain growth rates for value added for each of the sectors of interest for the Report. These assumptions drew on an analysis of the historical patterns for the sectoral growth multipliers.
5. The resulting growth rates for each sector were then applied to the base year (2008) estimates of value added for each sector to obtain projected values for value added by sector. The "commercial agriculture sector" was treated as a residual in the exercise and was obtained as the difference between total GDP and the sum of value added for all other sectors.

ESTIMATION OF HISTORICAL VALUES FOR ICORs

The historical values for ICORs were calculated using the UN national accounts data included in Annex I. Estimates of ICORs typically vary according to the method by which they are calculated. For the purposes of this Report, various ICORs for the period 1970-2008 were calculated as three-year moving averages in order to smooth out year-to-year swings in GDP that have little or nothing to do with the prevailing level of investment. In the case of Burundi, the onset of droughts typically raises the ICORs because of the large decline in agricultural output. Three different data sources were used for these calculations: (i) the national income accounts at current market prices as published by the IMF in various editions of the *International Financial Statistics Yearbook*; (ii) national income accounts at current market prices as published by the United Nations Statistical Office (UNSO) on their website; (iii) and the national income accounts at constant prices as published by the UNSO, after rebasing these from 1990 to 2007 constant prices.



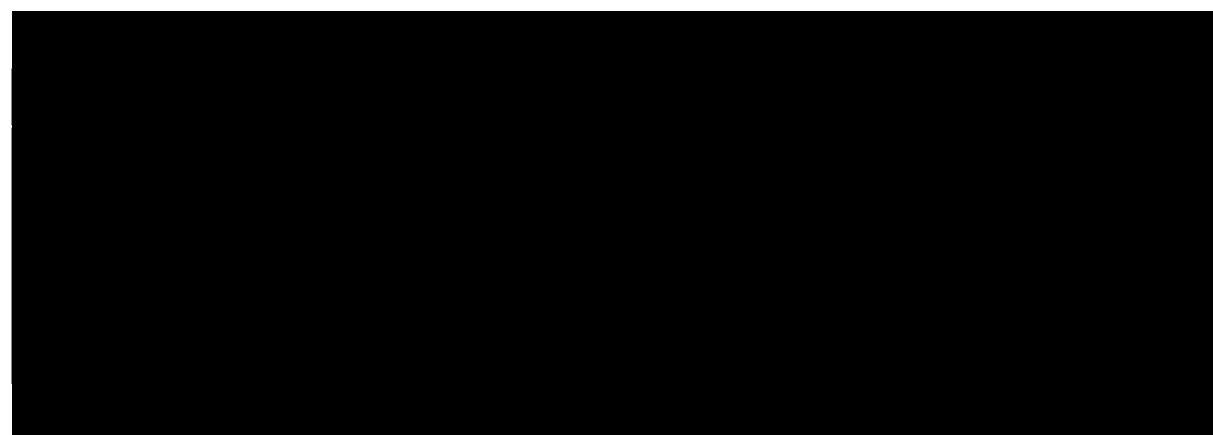
The resulting estimates for ICORs are set out above in Annex Table VI.1. When the ICORs are calculated with current market price data, they have very low values throughout the period 1970-2007. In fact, the

⁶ An ICOR measures the incremental investment attained in the past for each additional unit of output. An ICOR of four means that a GDP growth rate of one percent was associated with an investment-to-GDP ratio of four percent. The standard formula for an ICOR is as follows: the ICOR for any particular period equals the level of fixed investment in that period divided by the change in GDP from the previous period.

IMF and UN current market price data both give ICORs of about 1.5 for this 38 year period. When they are calculated at 2007 constant prices, they are substantially higher for the 1970s, 1980s and for the current decade. During 1970-1989, the ICOR for Burundi averaged about 3.2 at 2007 constant prices – in line with the best performing African countries – and the investment level rose from an average of nine percent of GDP in the 1970s to 16 percent in the 1980s.⁷ The civil war in the 1990s was a major setback for the economic development of the country, reversing the gains of the two previous decades. During 2000-2007, the ICOR has averaged 6.1 at 2007 constant prices.⁸ For the period 1970-2007, the ICOR at constant 2007 prices is estimated at 3.6, which is lower than that estimated in a recent IMF study.⁹ For the immediate future it is reasonable to expect a sharp increase in the ICOR. There will be a large increase in public investment as a result on ongoing donor programs, but the output response will take several years to materialize. See Annex Table VI.4 for the assumed ICORs used for these projections.

PROJECTION OF PUBLIC AND PRIVATE INVESTMENT EXPENDITURES

Annex Table VI.2 sets out the ongoing and proposed new public and private investment for each of the sectors. Expenditures in this Table on the proposed Action Plan differ from those in others because development expenditures on capacity building and technical studies are excluded. These are not treated as capital expenditures in this Report. For the purposes of this Report, all the private investment included in the Infrastructure Action Plan is assumed to be foreign investment. Some of the \$3 million a year of private investment in communications may, in fact, come from the existing domestic service providers, but the amounts involved are assumed to be small. As noted in Chapter 3, not all of these private investment inflows would be foreign direct investment. A significant portion of the inflows would be financed with commercial debt.



MULTIPLIERS USED TO PROJECT THE GROWTH IN SECTORAL VALUE ADDED

In the simple economic model used in this Report, projected values for growth multipliers for each sector are used to derive the growth rates for value added in each sector at 2007 constant prices. These projected

⁷ The ICORs of faster growing countries are usually in the range of three to four. See W. Easterly, *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics*. Cambridge MA, MIT Press, 2001.

⁸ One of the consequences of the adjustments to investment expenditures described in Annex I is an increase in the incremental capital-output ratios (ICORs) for the years in which the adjustments were made, since there was no corresponding adjustment to GDP.

⁹ See Olivier Basdevant (2009), *How Can Burundi Raise Its Growth Rate? The Impact of Civil Conflict and State Intervention on Burundi's Growth Performance*. IMF Working Paper, WP/09/11. According to a recent IMF study, the incremental capital output ratio (ICOR) for Burundi was 5.2 for the period 1970-2007. This compares with an average ICOR of 6.4 for all Sub-Saharan countries in this period, and an average of 4.5 for the fastest growing countries in Sub-Saharan Africa. The IMF paper argues that the high ICOR stems from inefficient investments.

values were drawn in part from historical data for each sectoral multiplier. As Table VI.3 indicates, there has been substantial variation in these multipliers over the past four decades.¹⁰ The multiplier for agriculture is typically less than one, while the multipliers for other sectors are typically greater than one. The exception has been "other services" in Burundi, which, until recently, has not been a source of growth the economy.

The projected values used for these multipliers and the ICORs is given in Annex Table VI.4. The choice of these multipliers was based in part on the above estimates for 2005-08 and for the "adjusted" estimates. An underlying consideration was that if the Infrastructure Action Plan were to be implemented, and if there was firm action on policies and programs aimed at promoting a strong domestic supply response, then the construction and transport sectors would experience rapid growth in the decade ahead, given the large amount of civil works in the program and the implications for the transport of large volumes of freight. The manufacturing sector was also expected to respond to the opportunities created by increased incomes and consumer demand. The implication is that the industrial sector was expected to expand strongly, followed by services, and commercial agriculture. The food sector, dominated by large numbers of subsistence farm households was expected to expand at rates a little above the population growth rates.

PROJECTIONS OF VALUE ADDED FOR EACH SECTOR

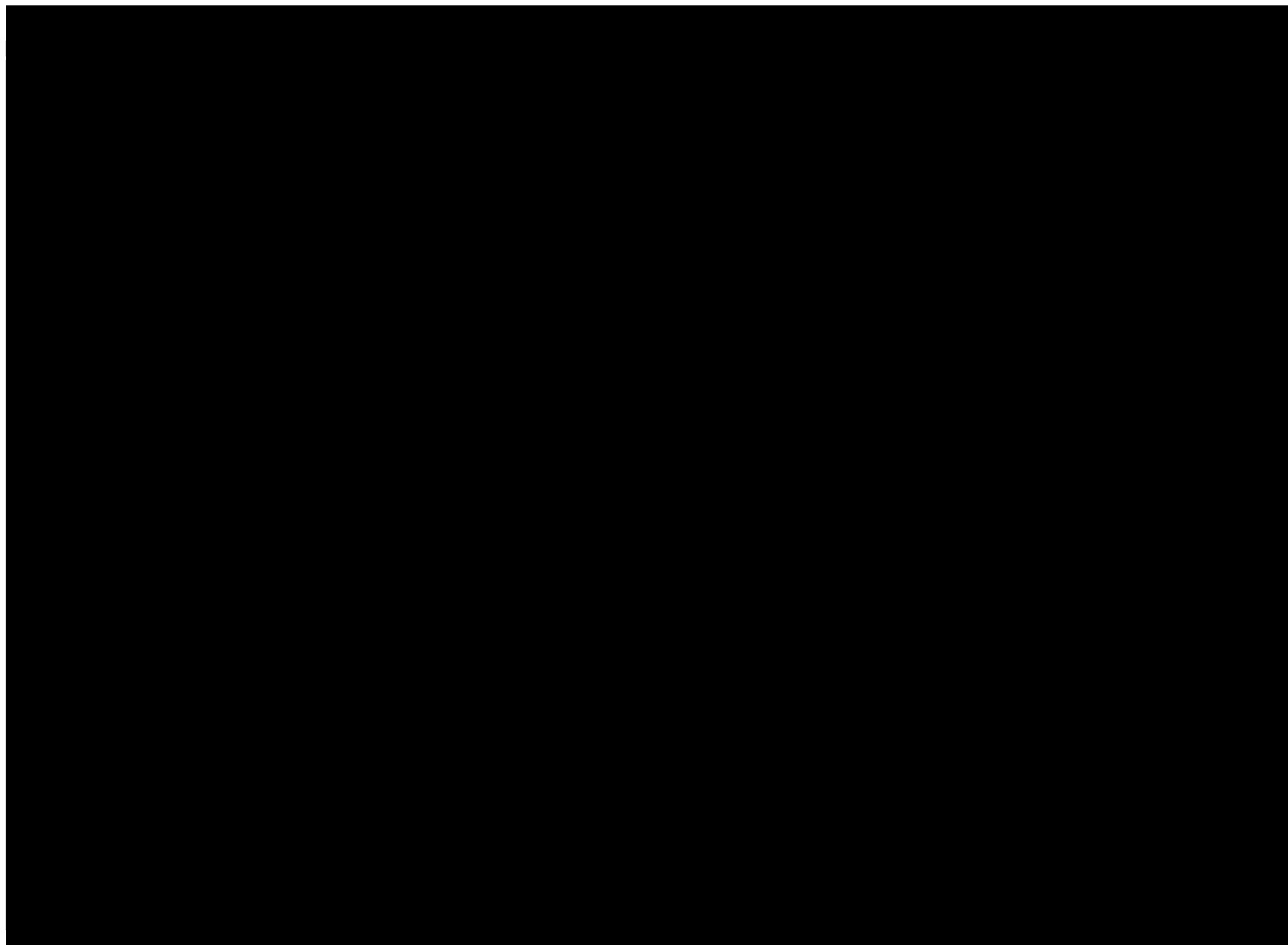
The multipliers set out in Annex Table VI.4 were applied to the GDP growth already calculated from the assumed ICORs in Annex Table VI.4 and the levels of investment in annex Table VI.2. The resulting annual growth rates for each sector are set out in Annex Table VI.5 below.

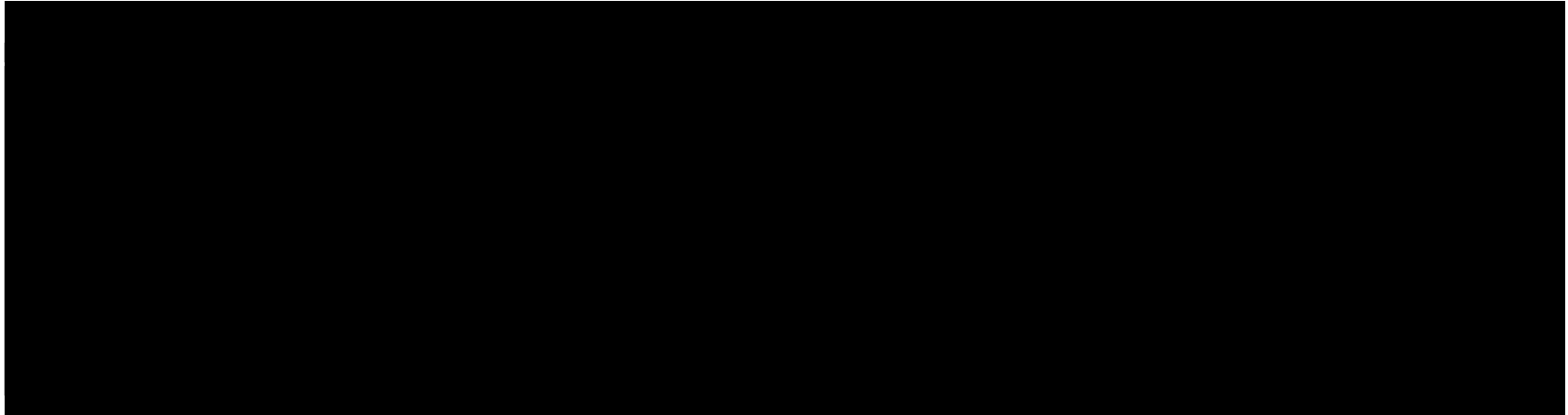
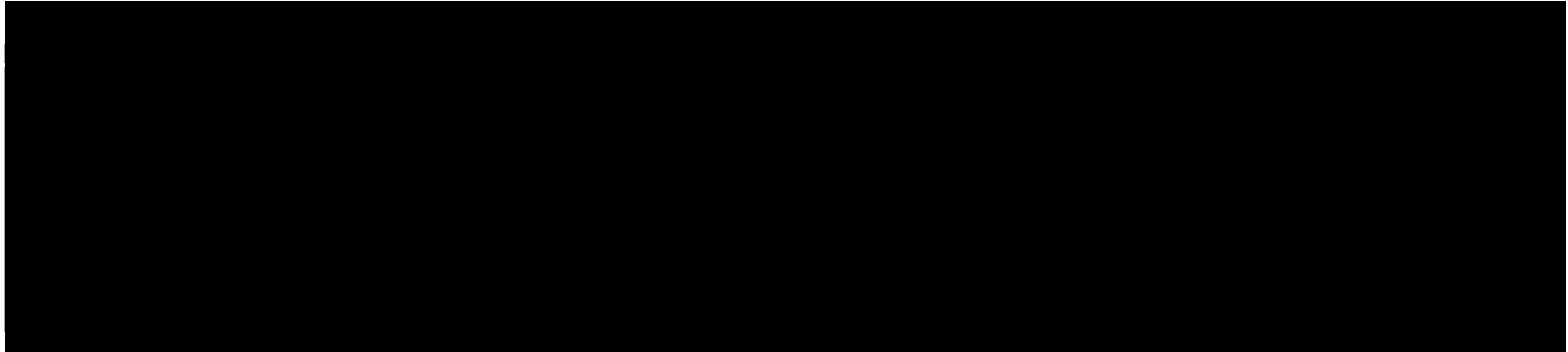
The next step in the process was to calculate value added for each sector. This was done for all sectors except the nickel mining project, by applying the annual growth rates in Annex Table VI.5 to the 2008 estimates of value added for each sector. In the case of the proposed nickel mining project, separate projections of investment, mining revenues and expenses were prepared for the project. A summary of these estimates is set out in Annex Table VI. 6. The residual value for commercial agriculture was then obtained by subtracting all other sectoral estimates of value added from the total for GDP. The resulting projections of value added (at 2007 constant prices) are set out in Annex Table VI.7.

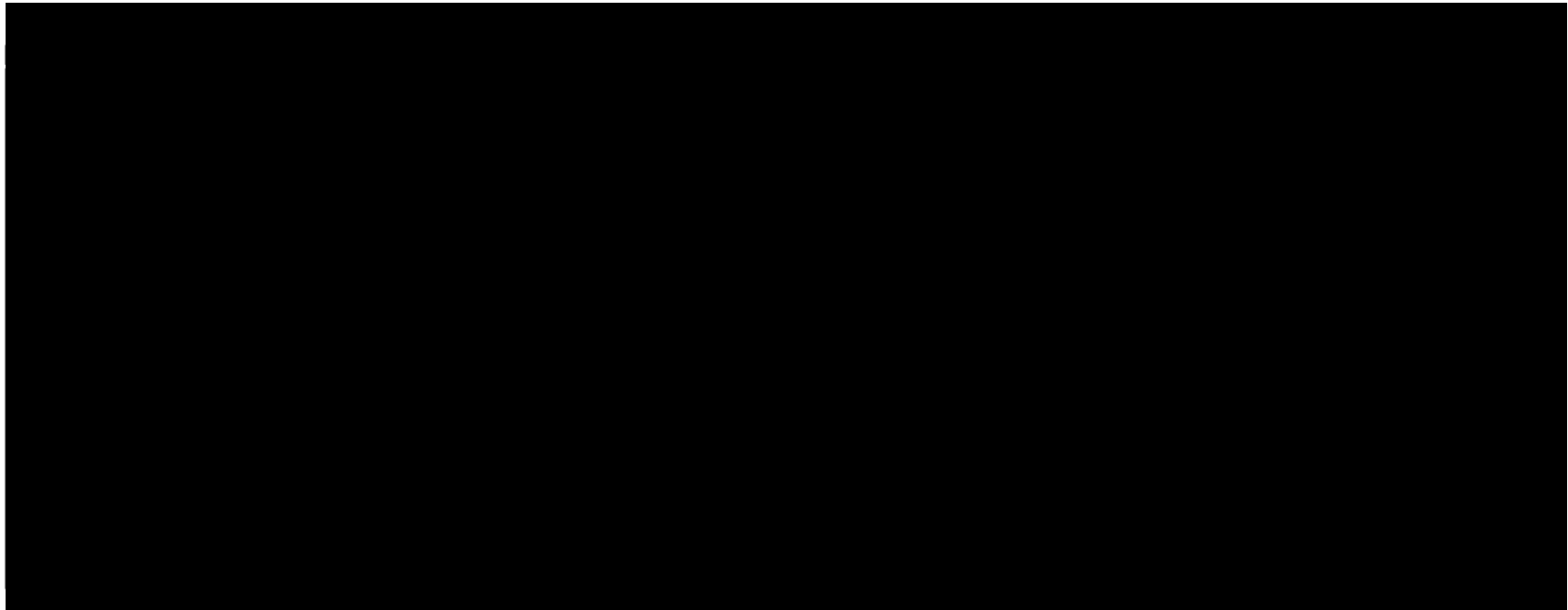
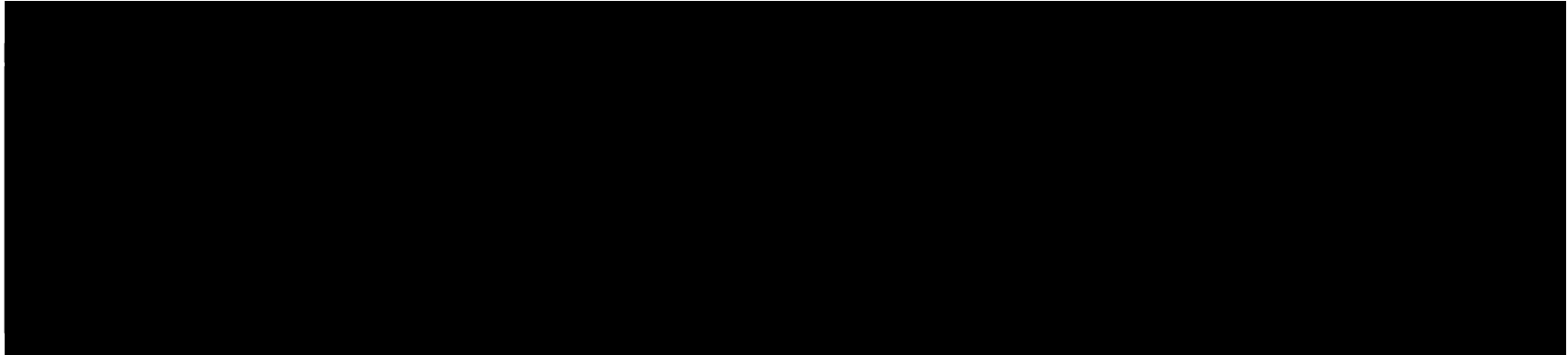
ESTIMATES OF ROUTINE MAINTENANCE EXPENDITURES

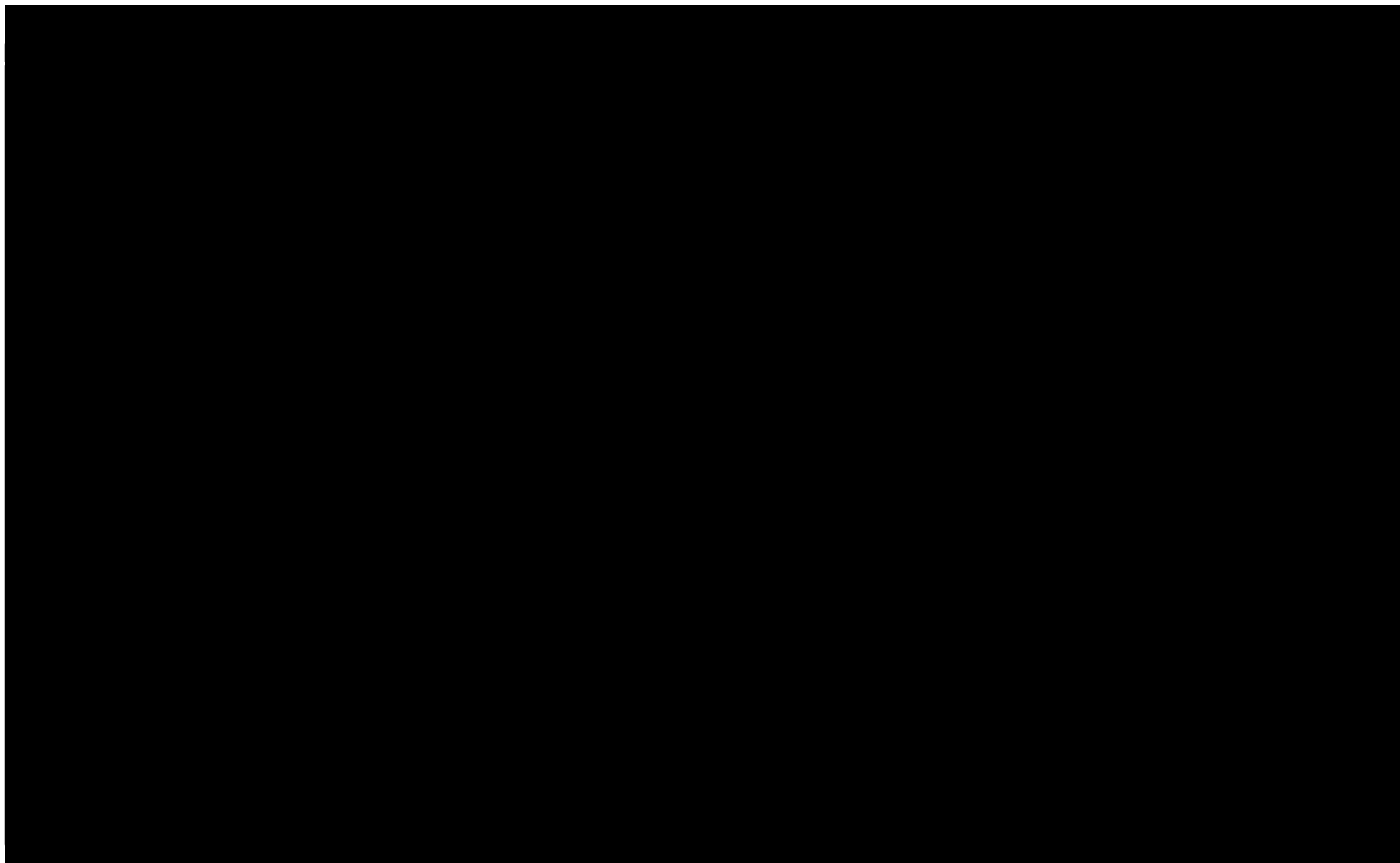
Annex Table VI.8 provides a summary of the routine maintenance expenditures included in the Base Case Scenario. For all sectors other than roads and ports, expenditures on parts and materials are assumed to be one percent of the cumulative capital stock in the sector, and expenditures on services (mainly labor) are assumed to be two percent of the capital stock. In the case of roads and the port, total maintenance expenditures were estimated separately. (See Annex Table VIII.4 for details on roads.) These totals for roads were then split 50:50 between parts and materials, and services while the split for the port was 70:30.

¹⁰ For each sector, the growth multiplier equals the average annual growth rate of the sector (in percent) for any particular period divided by the average annual growth rate of GDP (in percent) for the same period.









ANNEX VII: DATA FOR THE ELECTRIC POWER SECTOR IN BURUNDI

The following tables provide details of the data and projections that underpin the analysis and projections set out in Chapter 5.

Annex Table VII.1 provides an inventory of the installed capacity of all power plants in Burundi. It also includes the installed capacity for all proposed new power stations from the year in which they are to be commissioned. The dates for the commission of each new plant are given in Table 5.5 of Chapter 5.

Annex Table VII.2 provides information on power production, consumption and losses for the period 1997-2008.

Annex Table VII.3 reports on the number of connections reported by REGIDESO by type of account and whether the customer is located in Bujumbura or elsewhere in the country. Given the number of urban and rural households estimated in Annex Table II.4, it is possible to derive the electrification rates for urban and rural areas and the average for the country as a whole.

Annex Table VII.4 sets out the projections of electricity consumption that were prepared for this Report. The projections were prepared with the following sequence of calculations:

1. The total urban and rural populations and numbers of households, as reported in Annex Table II.4, were used to obtain estimates of the number of the households to be electrified. The basis for these calculations was the Government's announced objective of electrifying 25 percent of households by 2020. Discussions with senior officials of the Government indicated that the target for 2030 should be at least 40 percent electrification of households. For the purposes of this Report, electrification of 85 percent of urban households was set for 2020 and beyond. Given the national electrification targets, the rural electrification rates were derived as a residual. The rationale for the rapid electrification of urban areas was twofold: (i) by connecting all 13 provincial capitals to the national grid by 1015 when the national transmission grid would be in place, the foundation would be laid for achieving the 25 percent electrification target by 2020; and (ii) an aggressive push to provide reliable power supply to all urban centers by 2015 would also ensure that all urban-based businesses activities had access to reliable supplies of power at reasonable cost, thereby removing one of the main obstacles to sustained development of private business and hence, improving international competitiveness and employment opportunities.
2. Based on data for urban household consumption of electricity as reported by REGIDESO (see Table 5.2 in Chapter 5), and using an independent estimate for average rural household consumption of power, the total household consumption of electricity can be calculated from the number of household electrified each year. Separate assumptions were made about the growth in the number of government, business and other types of accounts, using the baseline information on account numbers provided by REGIDESO, as reported in Annex Table VII.3. The number of government accounts was assumed to increase only very slowly in line with the growth in government services projected in the national income accounts as discussed in Annex VI above. The growth in power consumption by the private sector (other than households) was based on an assumed growth of new business registrations of seven percent a year, and an assumption that average electricity consumption per business would grow by seven percent a year as well in response to business opportunities created by an economy growing at 6-7 percent a year in real terms. In addition, the projected demand for power by the mining industry was estimated separately. Based on discussions with mining industry representatives familiar with the nickel deposits in the Musongati area, it was assumed that mining operations there would require about 650 GWh of electricity each year, which implies an available capacity of 75 MW of power.

3. System losses for recent years were provided by REGIDESO, as reported in Annex Table VII.2. Losses are projected to decline as a result of increased metering and rehabilitation of the power network. For the medium-term, the projected percentage of system losses was obtained from the World Bank (2008) Appraisal Report for the ongoing Multi-Sectoral Water and Electricity Infrastructure Project. For the longer-term, system losses were assumed to decline steadily to 10 percent by 2025 and then remain at this level.
4. The projected total electricity consumption in GWh is obtained from the addition of the above demand components, and from this total, the amount of generation capacity required to meet this demand is obtained from the following calculation: $MW = [GWh \times 1,000] / (365 \times 24)$. To this estimate of required capacity, a capacity utilization rate (for example, 65 percent) is applied to obtain the installed capacity needed to meet the projected demand.

Annex Table VII.5 converts the details about the installed capacity of each power plant set out in Annex Table VII.1 into estimates of available capacity (in MW).

Annex Table VII.6 converts the information about available generation capacities in Annex Table VII.5 into power supply expressed in GWh. The assumptions about capacity utilization rates that were used for these calculations can be obtained from the difference in MW between installed and available capacity for each category of plant listed in Annex Table VII.6. The Table then incorporates the projected demand for power from Annex Table VII.4 and derives the surplus/deficit in supply each year. As the Table indicates, a deficit equal to about 7.5 MW emerges in 2024 and increases to about 190 MW by 2030. The discussion in Chapter 5 outlines options for meeting this demand.

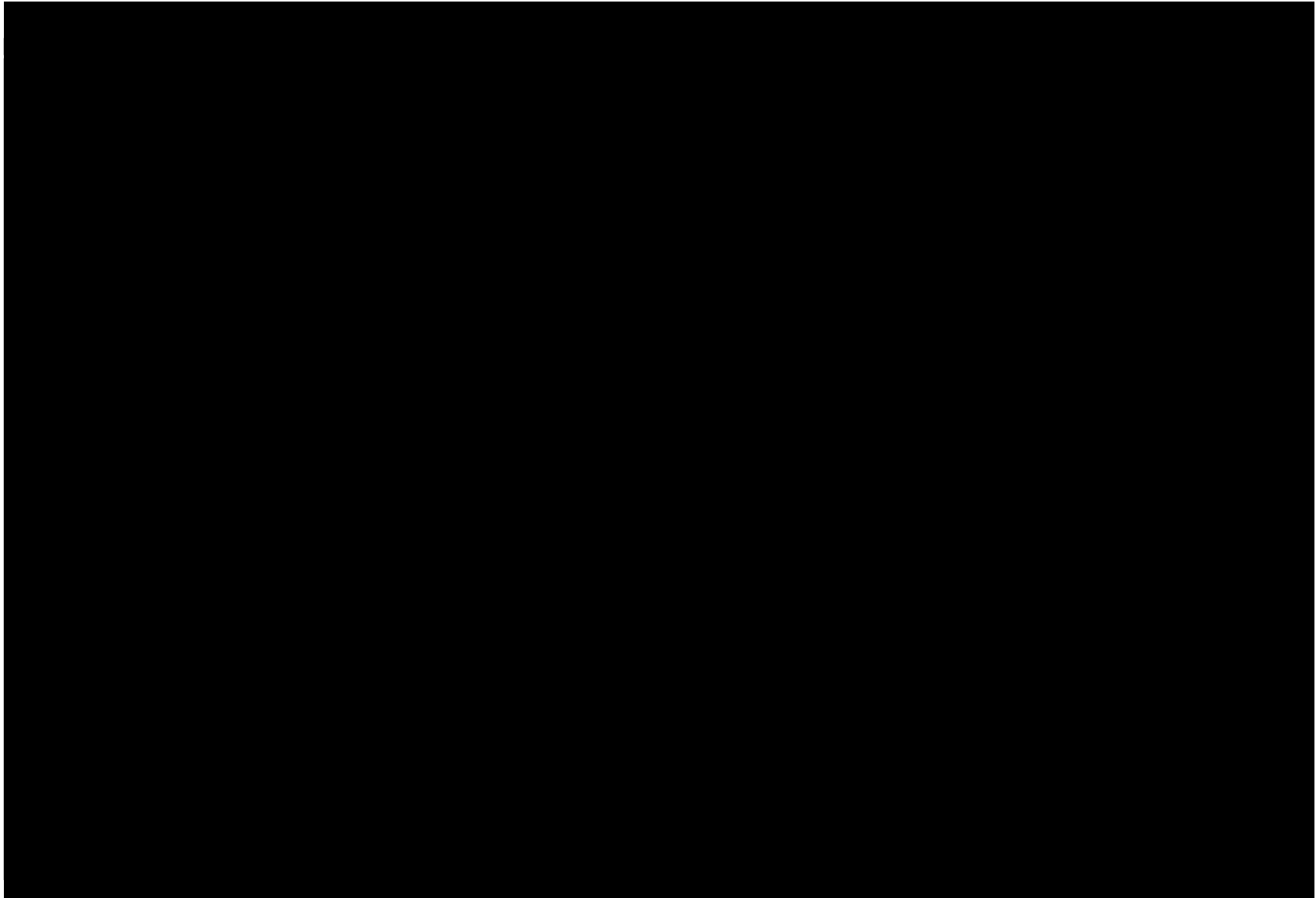
Annex Table VII.7 provides a summary of the proposed additions to generation capacity for the EAC and DRC for the period 2009-2020. The source of these data is the African Development Bank (2008) *Appraisal Report for the Interconnection of Electrical Grids of Nile Equatorial Lakes Countries*. Some of the data in the AfDB report has been updated for this Report, based on new information about the timing and capacities of some of the proposed domestic and regional projects that will benefit Burundi.

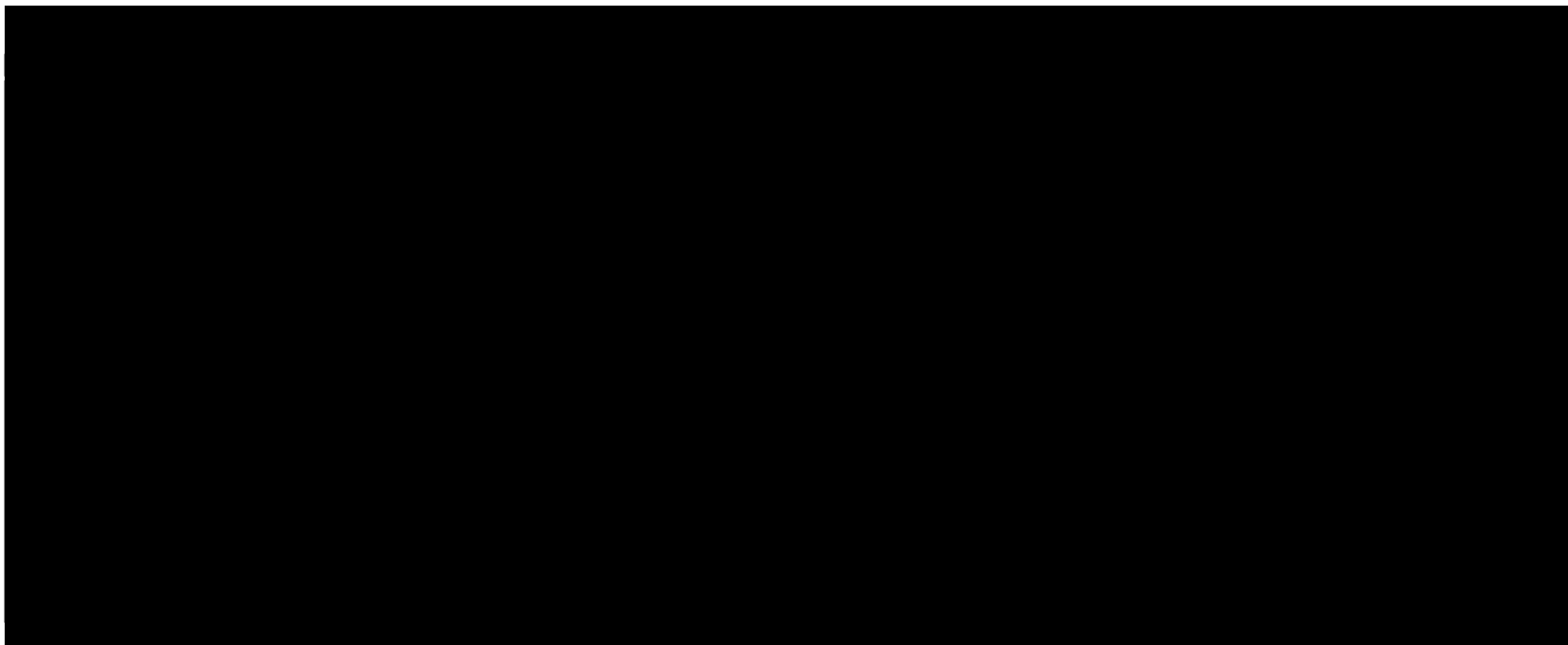
Annex Table VII.8 provides the details for the estimated capital expenditures for the distribution network needed to connect the 1.22 million customers of REGIDESO that are projected for 2030. The Annex Table includes all the assumptions about the unit costs per connection for the network. Table 5.8 and the associated discussion in Chapter 5 provides information about these cost assumptions.

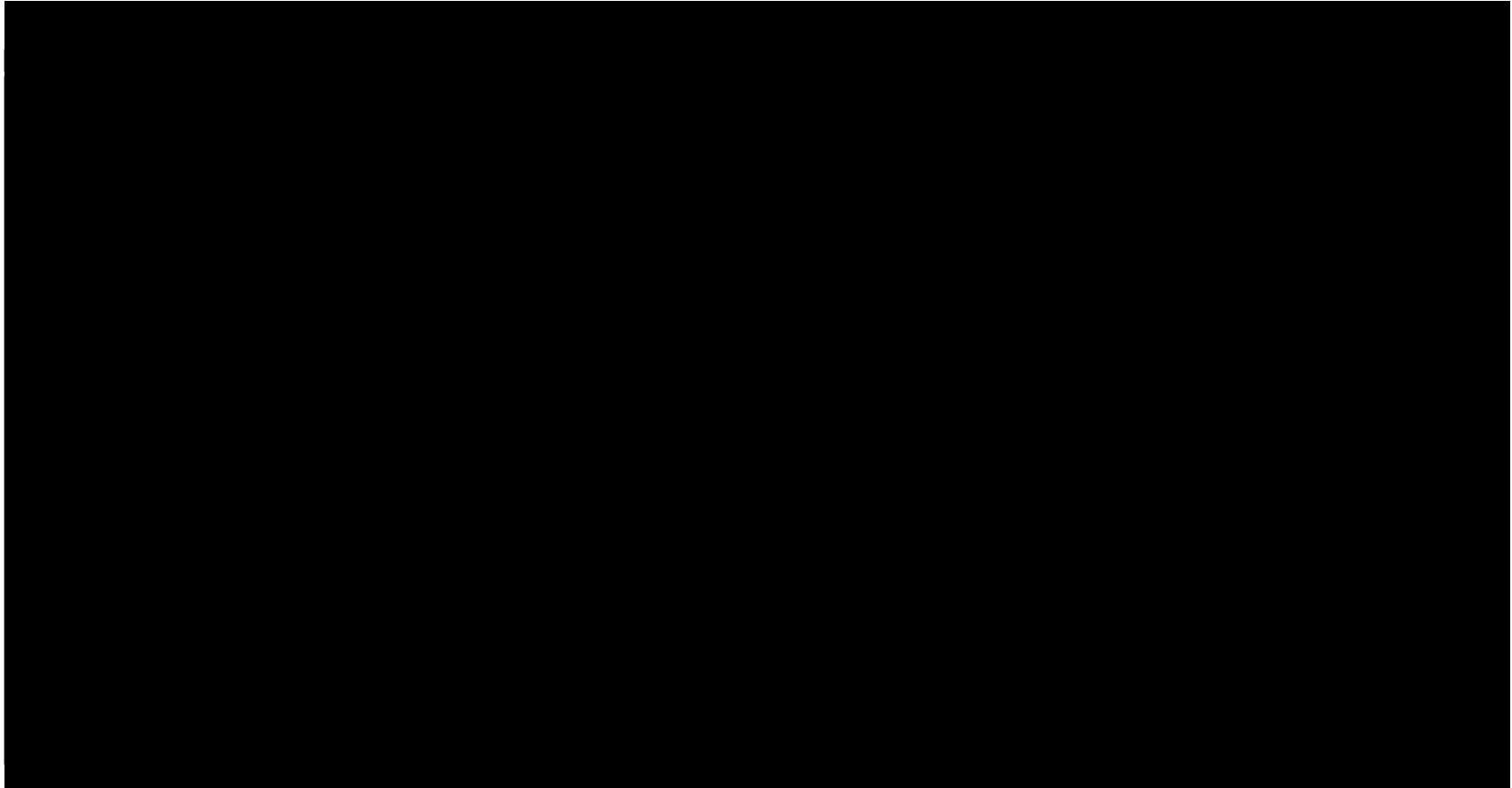
Annex Table VII.9 provides a complete listing of the development costs of the proposed power sector program, including the costs of technical support for capacity building and various technical studies, as well as the capital cost the generation, transmission and distribution programs. Chapter 5 includes a discussion of the costs of these various components. (See, for example, Table 5.5 for information on the cost of feasibility studies for the proposed new generation plants, and their capital cost.)

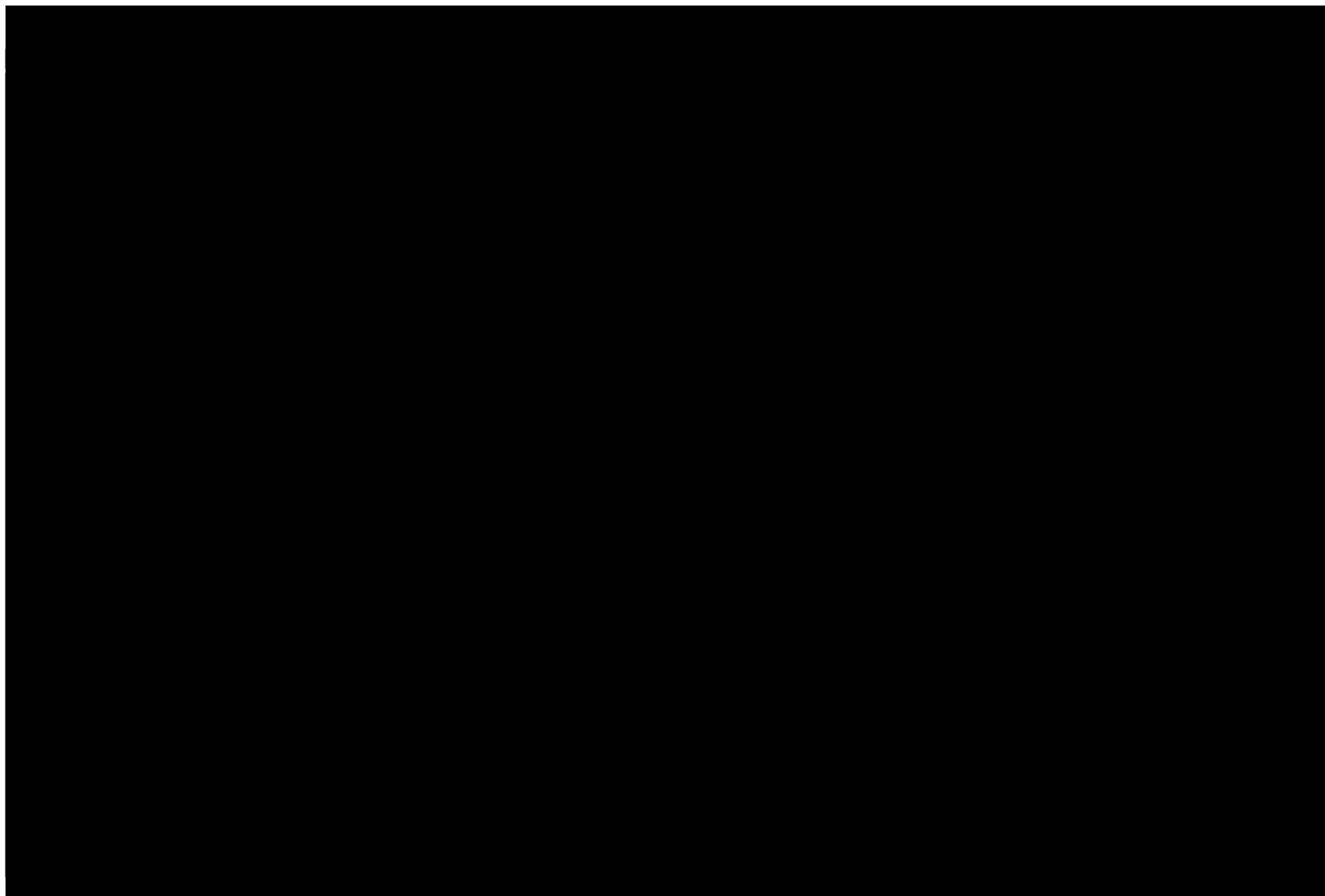
Annex Table VII.10 outlines a proposed financing plan for the power sector program. It includes private funding for six generation projects, as discussed in Chapter 5; a steady increase in the share of the program funded by the Government and REGIDESO from less than 10 percent at present to 45 percent by 2020 and 90 percent by 2030. The balance of the funding would come from donors.

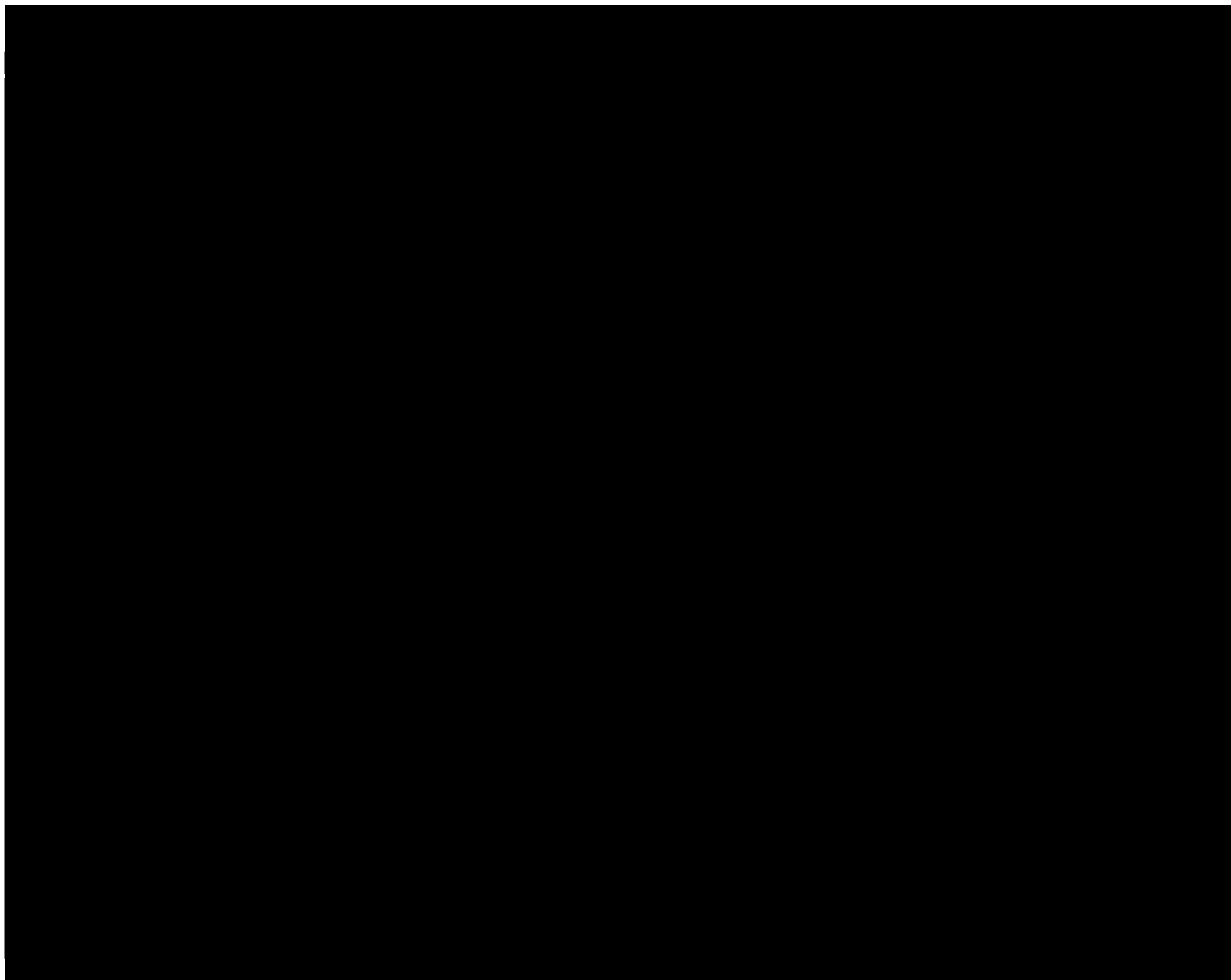
Annex Table VII.11 sets out a projected income statement for REGIDESO for 2008-2030. The base year information for the accounts came from AfDB (2008) and World Bank (2008) appraisal reports. The projections for 2009-2030 were prepared by the authors of this Report, based on a series of assumptions about key cost components. These assumptions are discussed in Chapter 5 and included in the Annex Table VII.11.

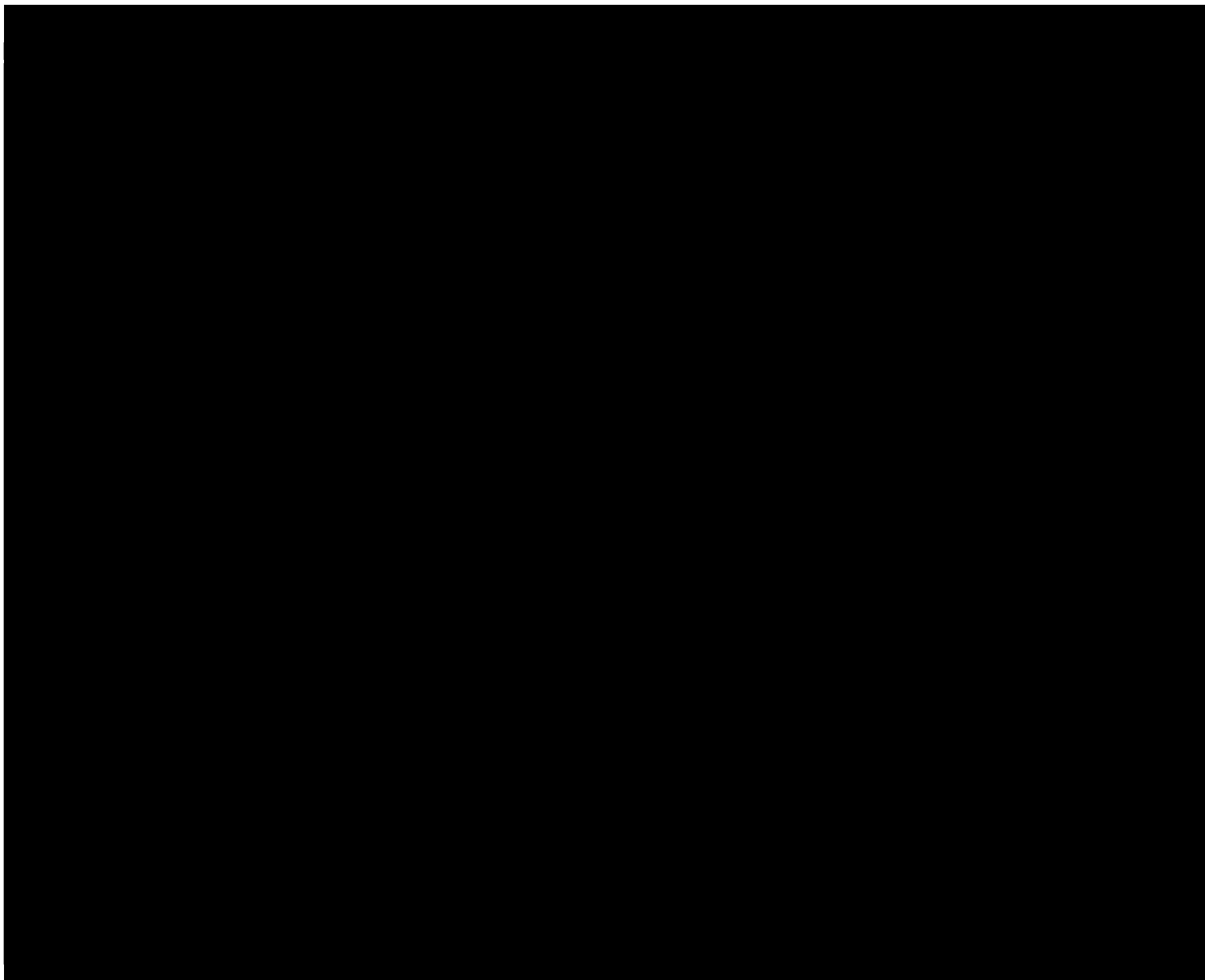


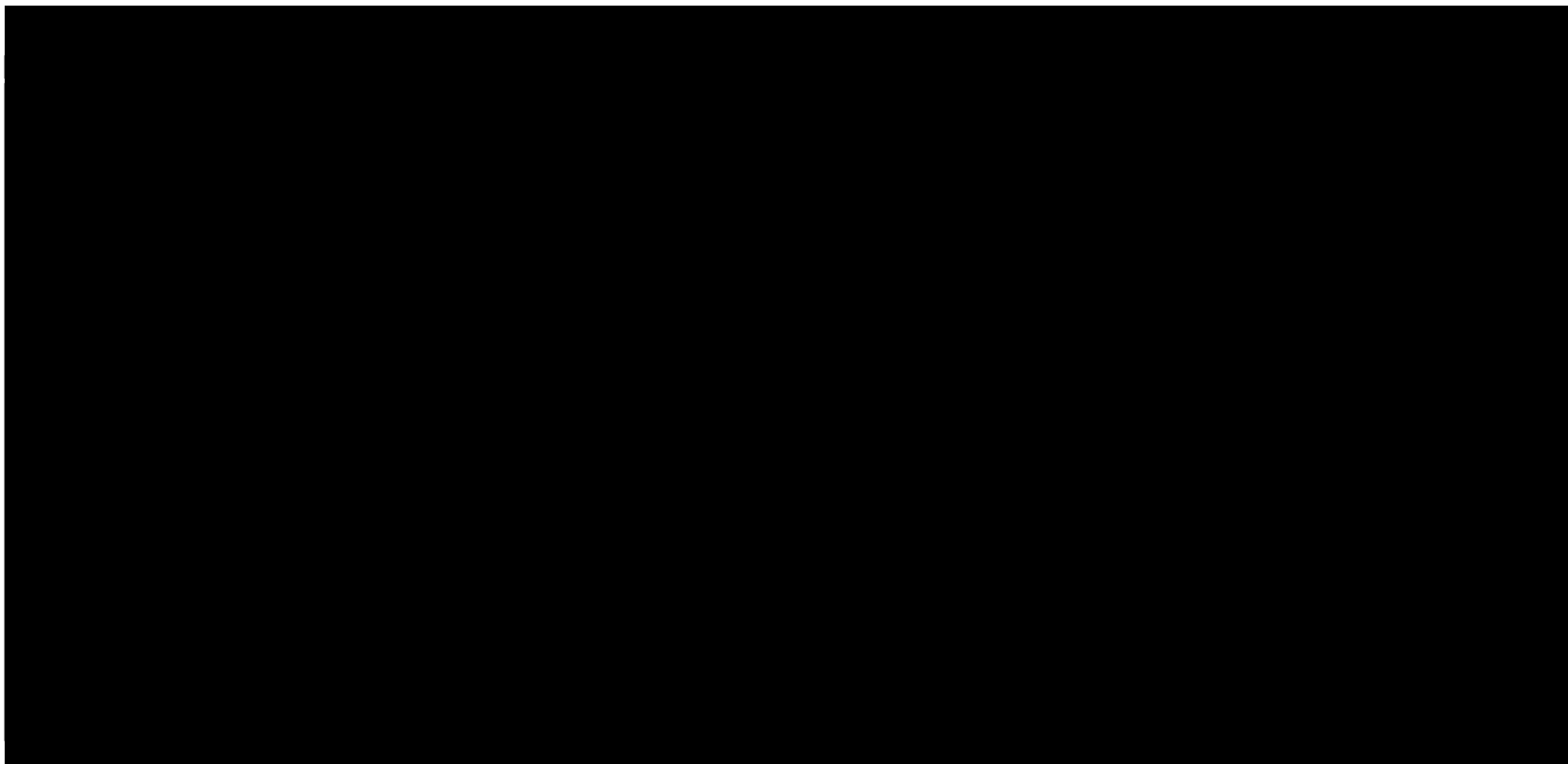


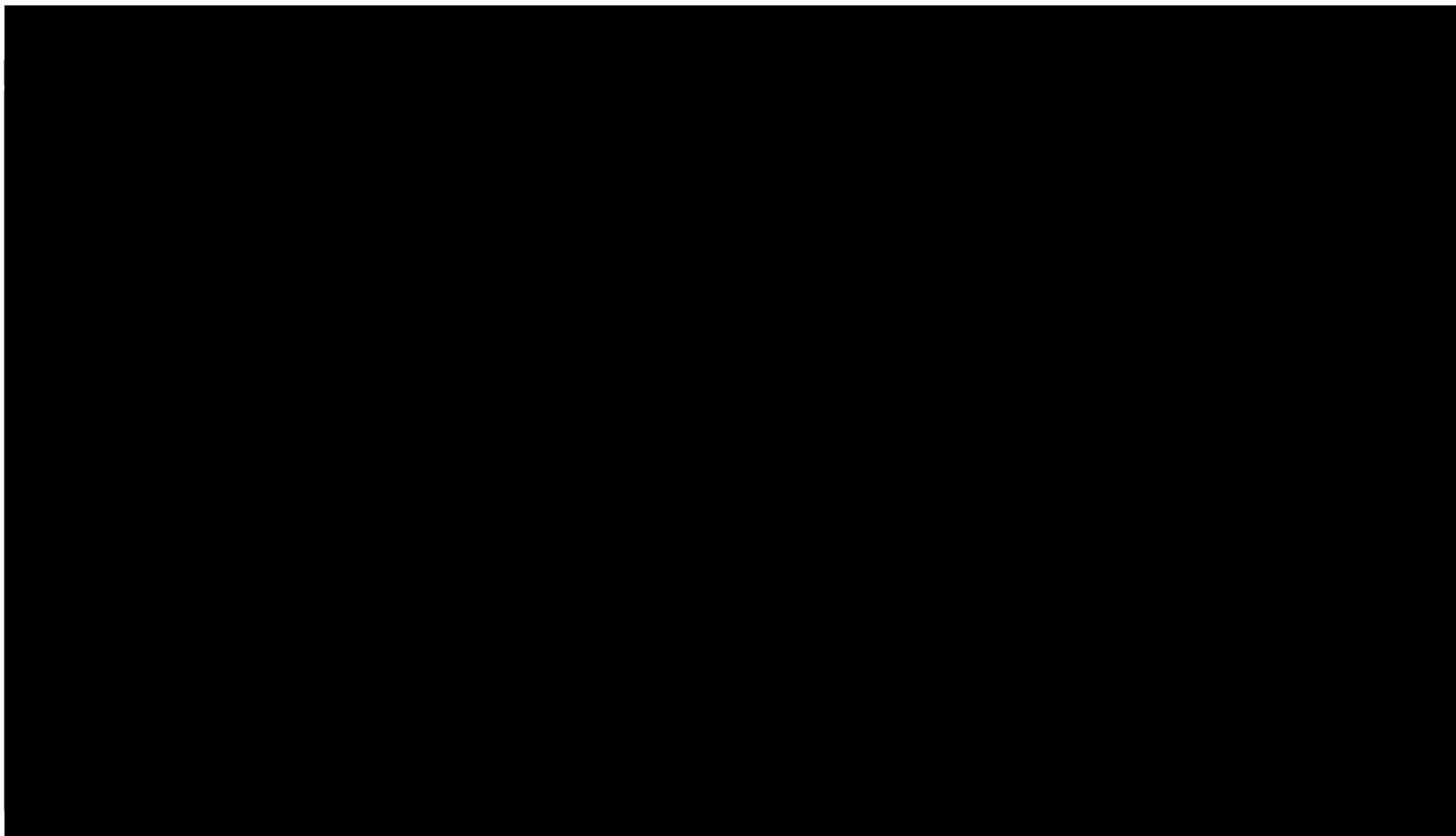


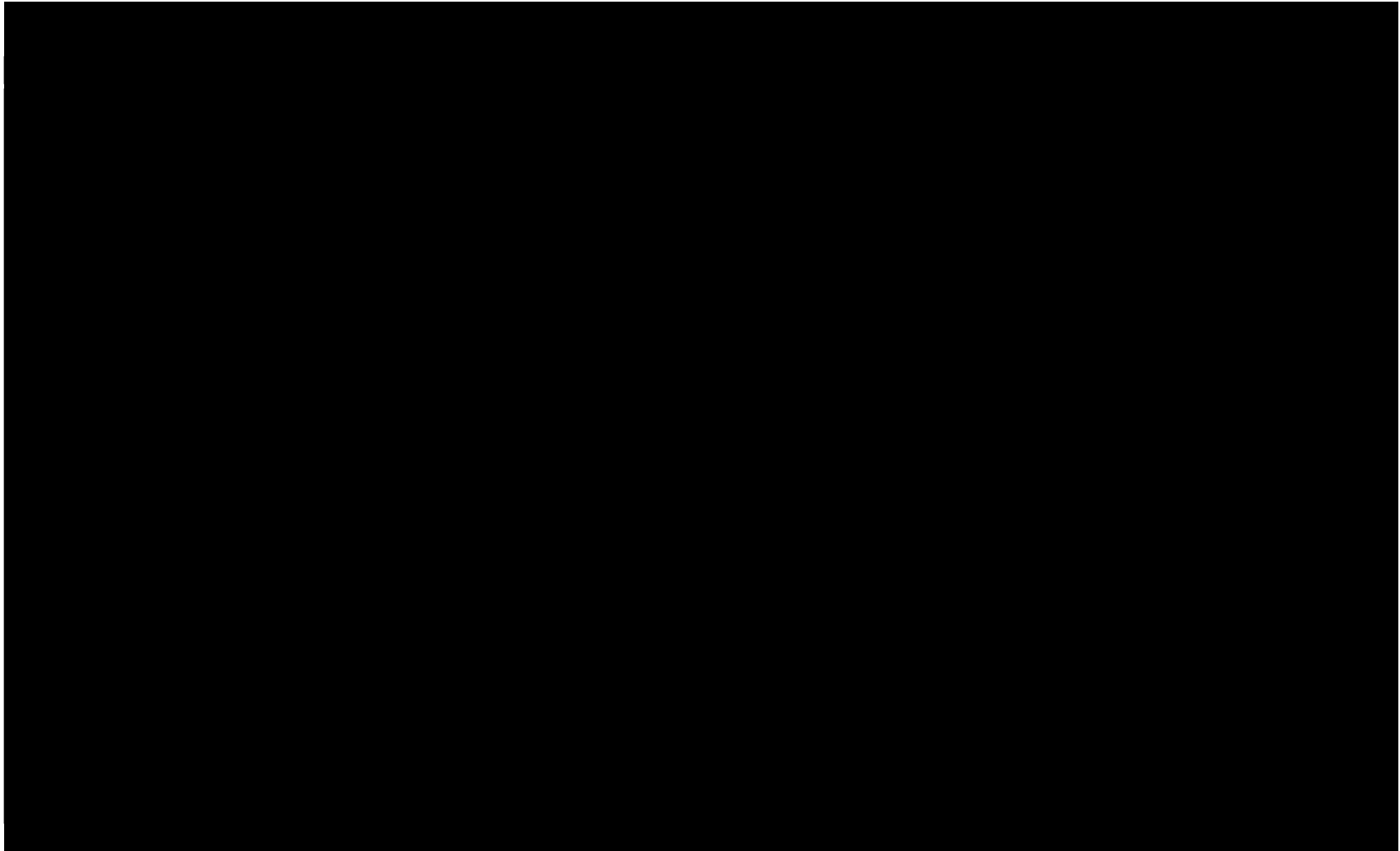


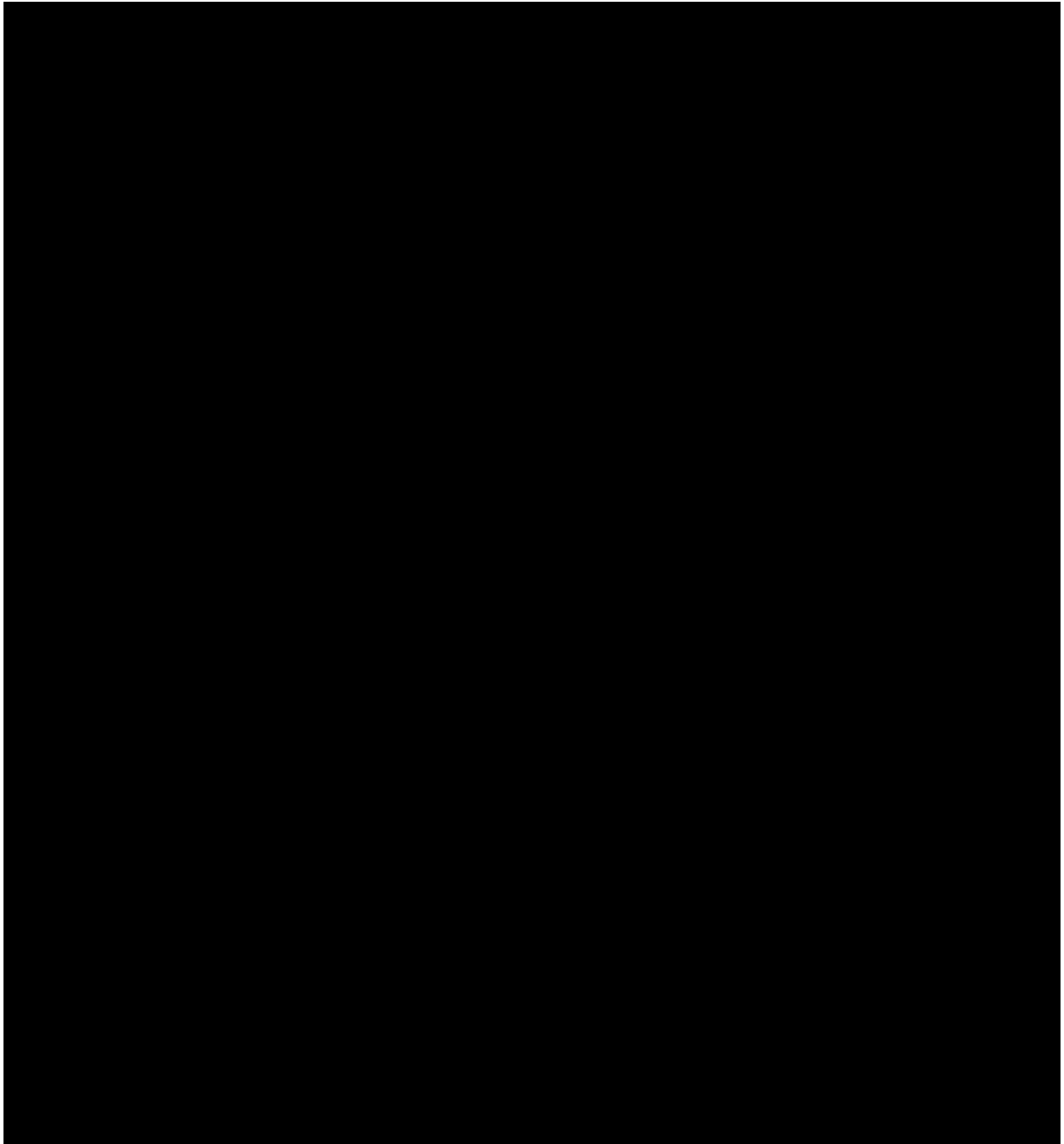


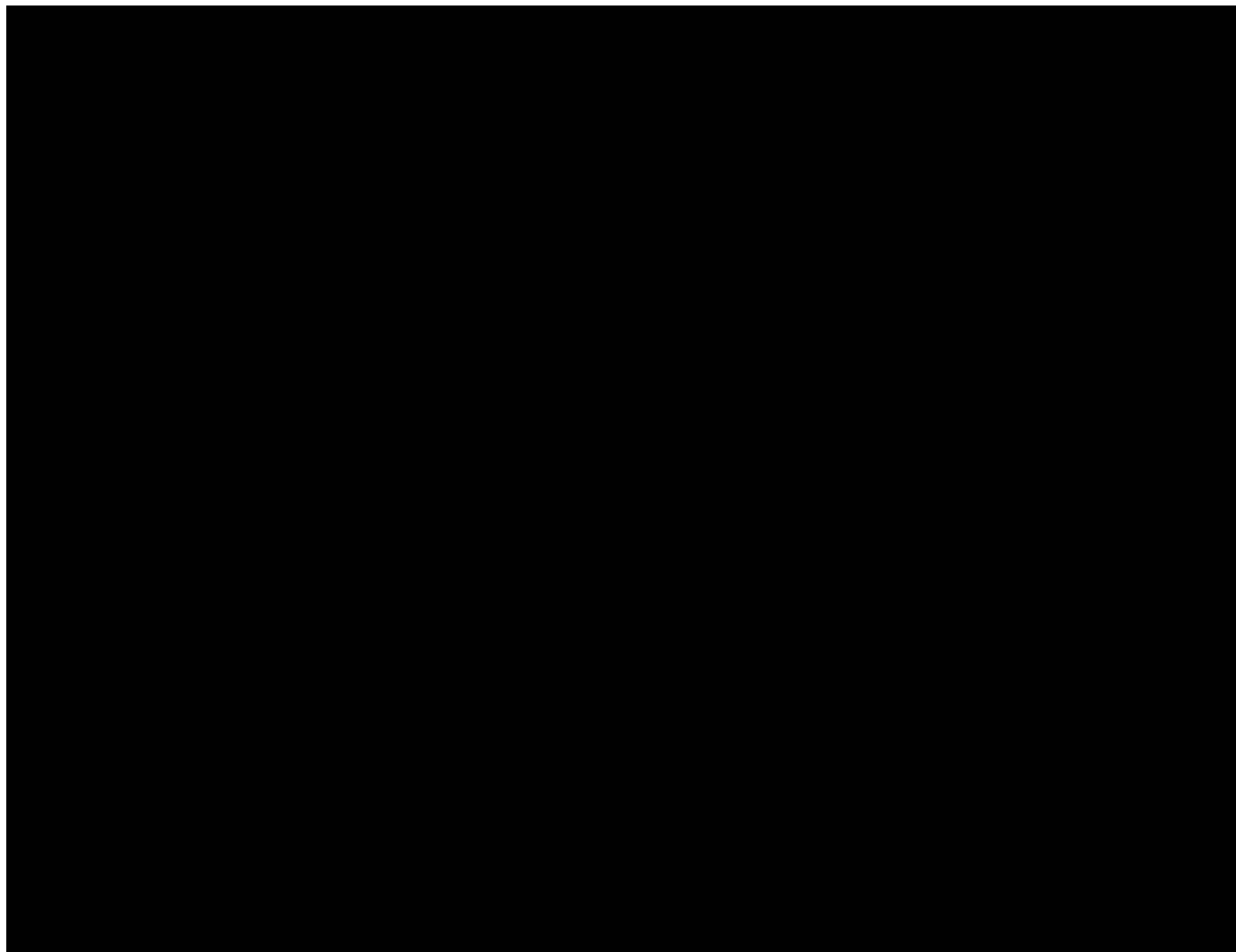


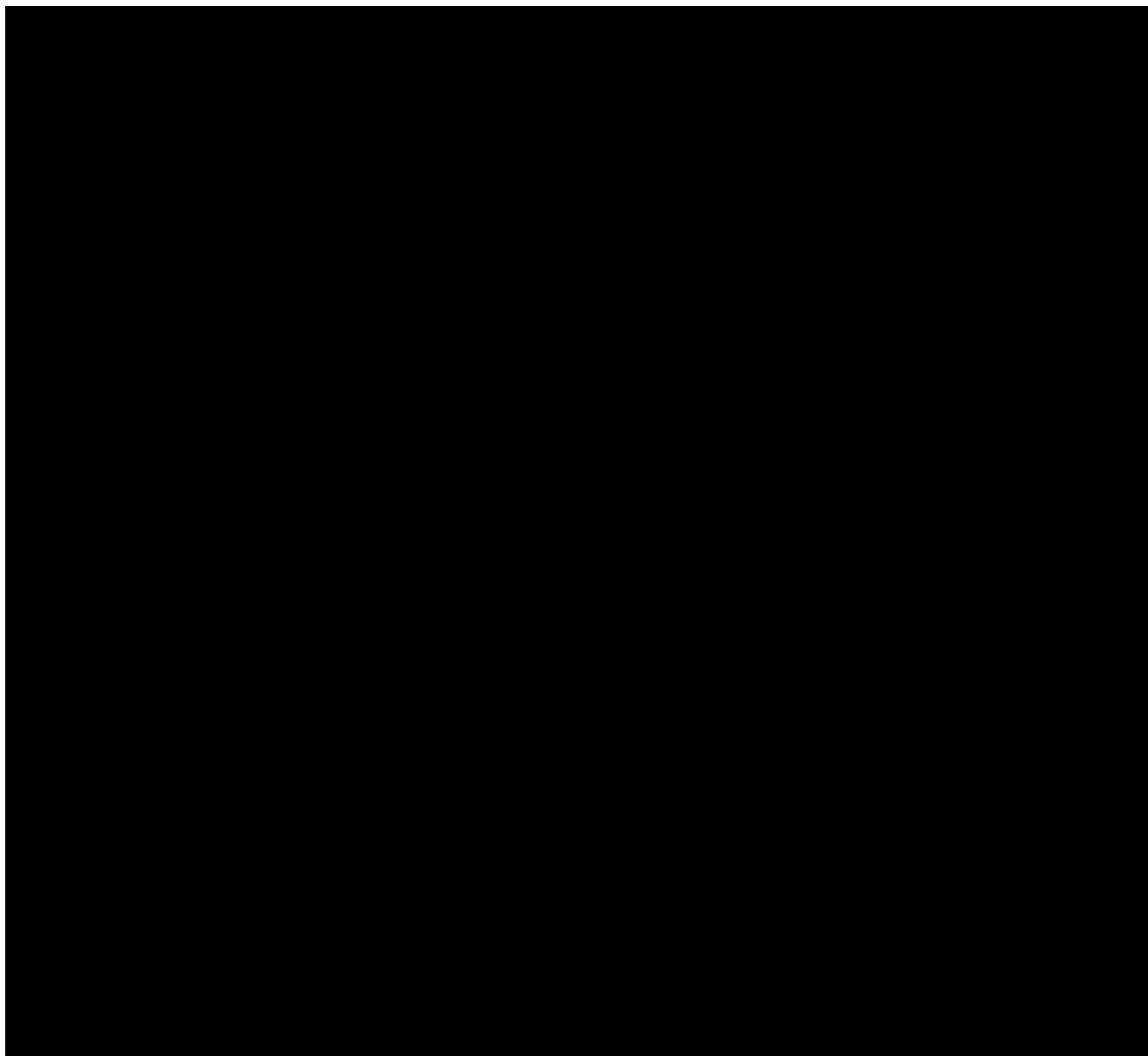


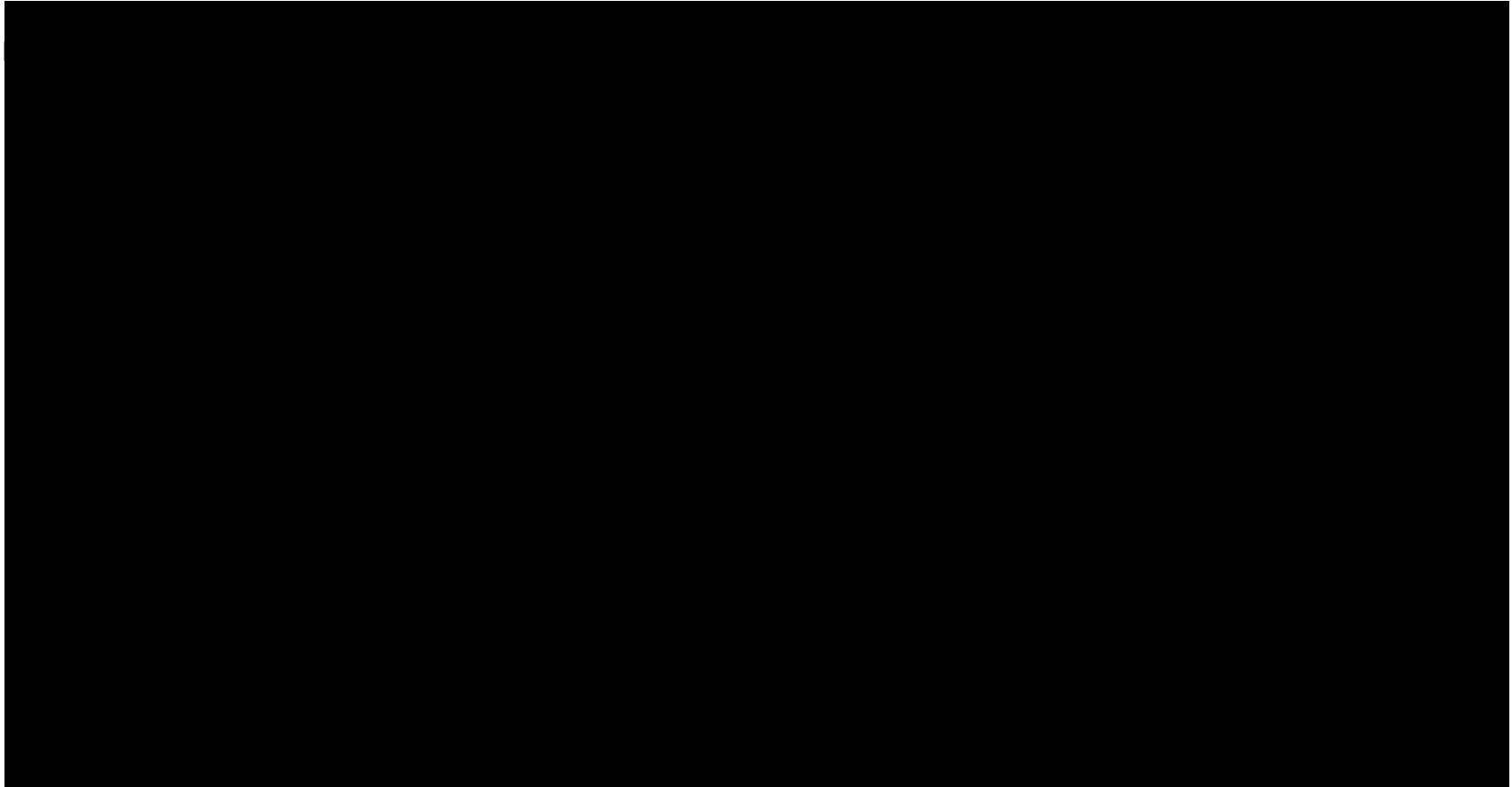


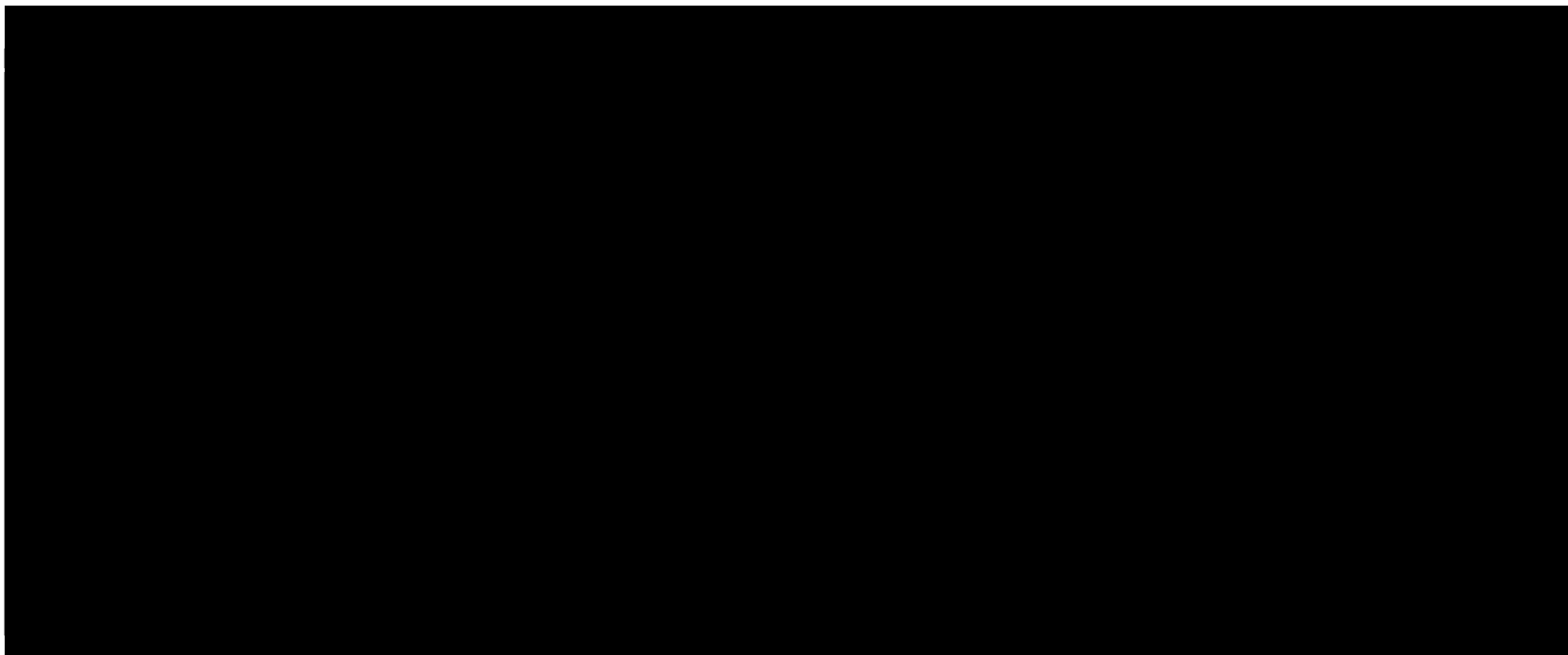


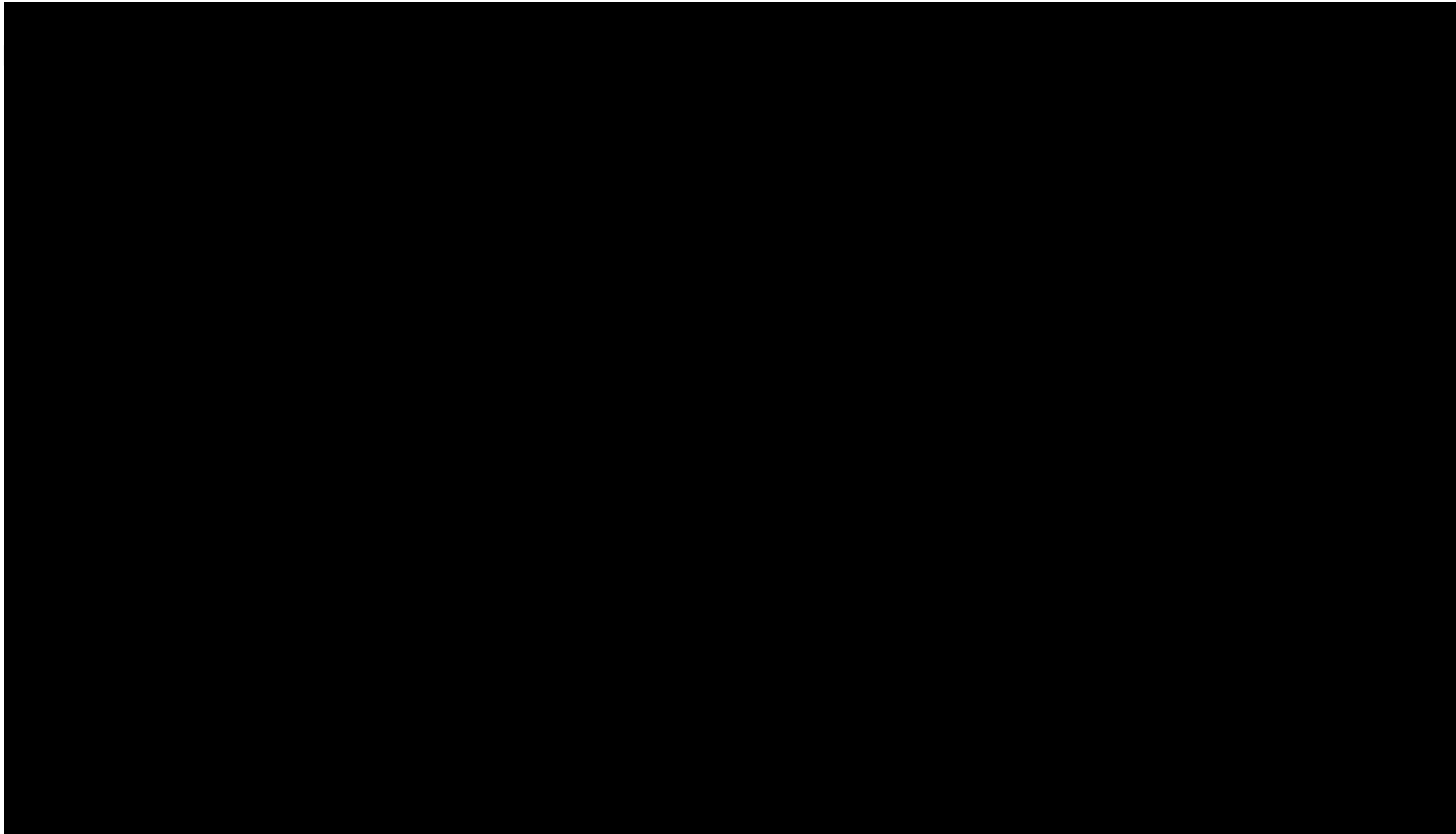


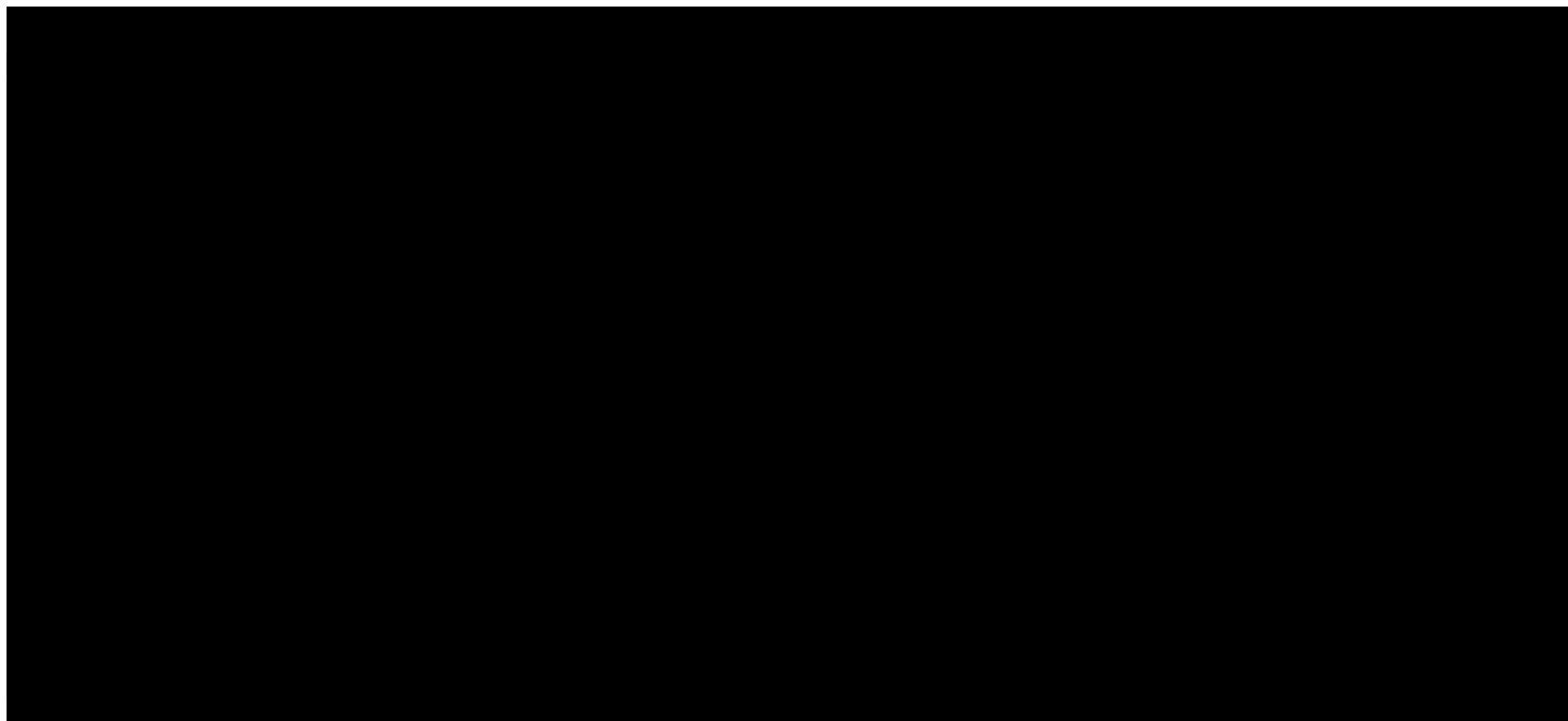


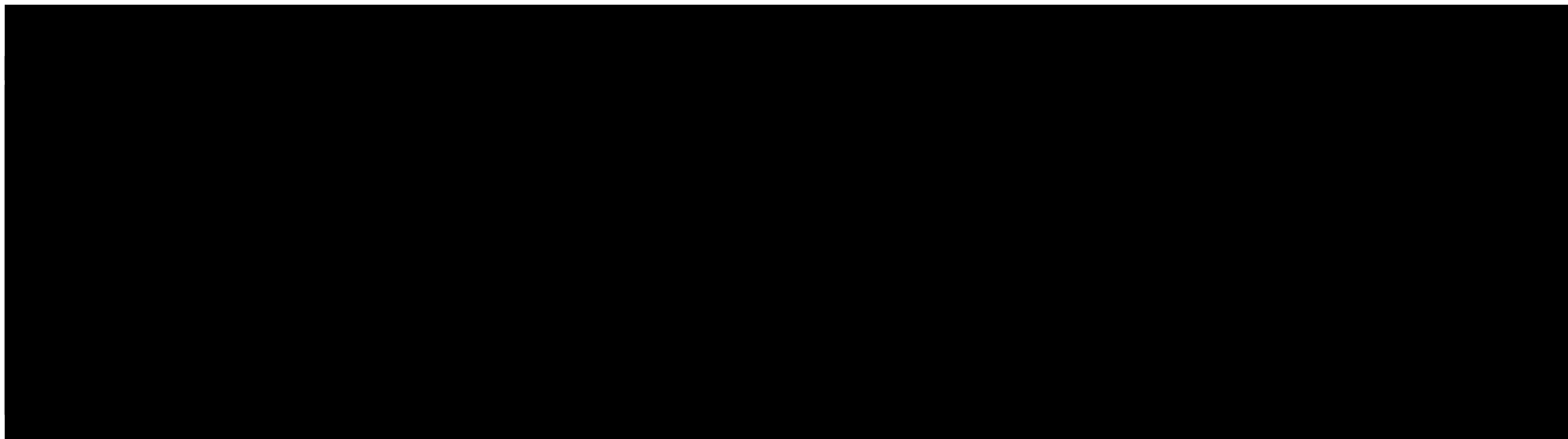
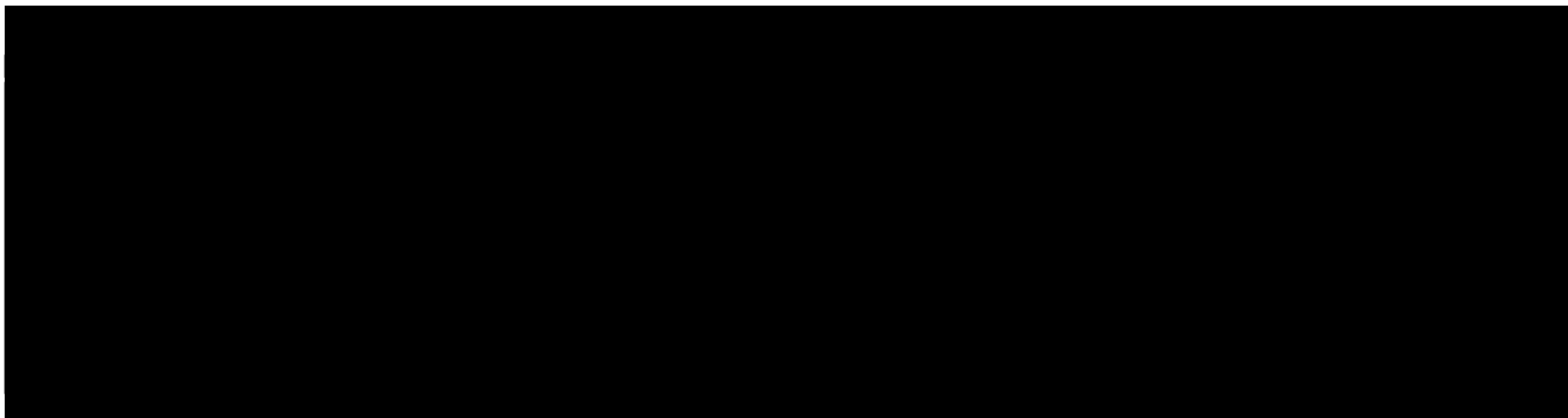


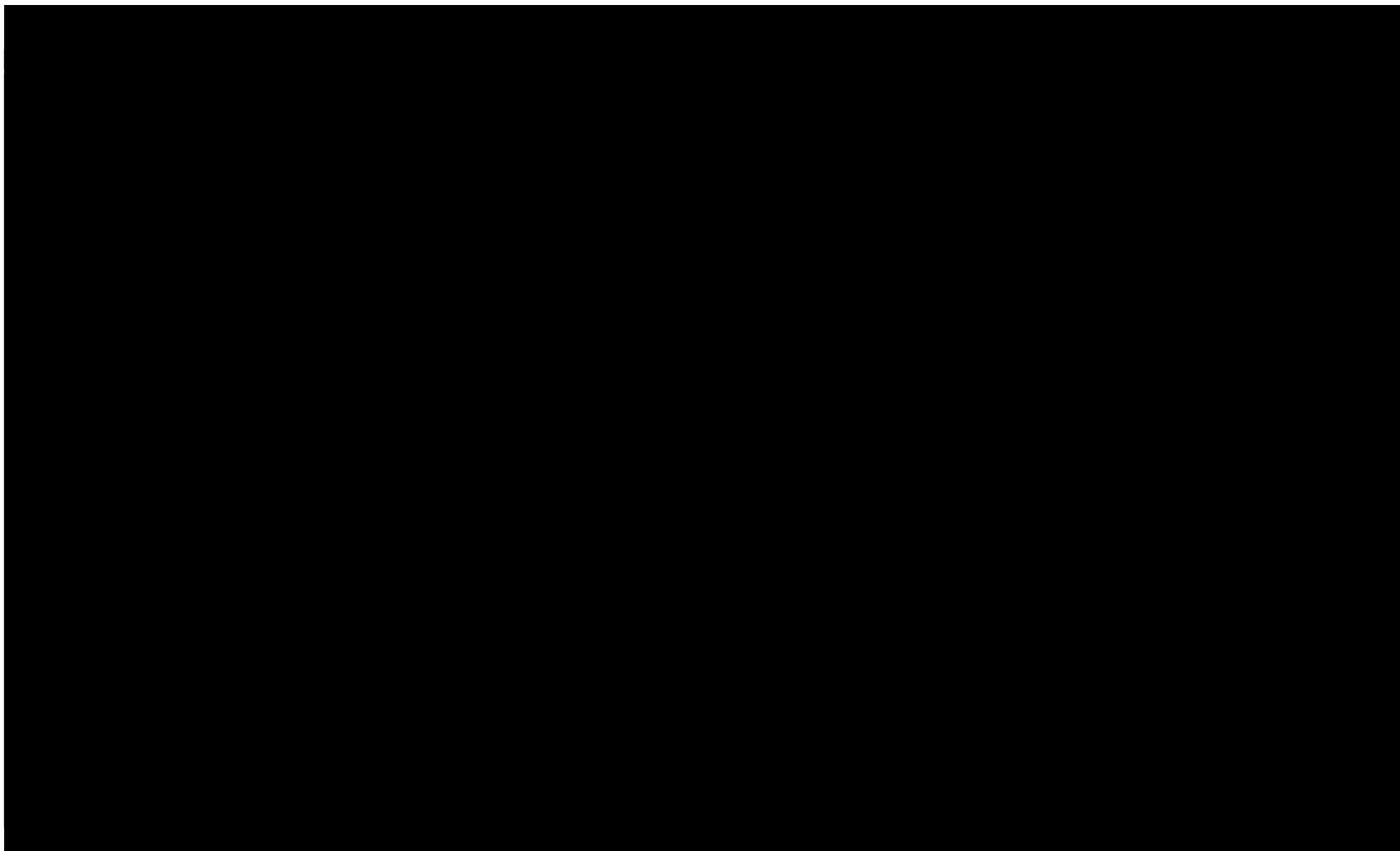


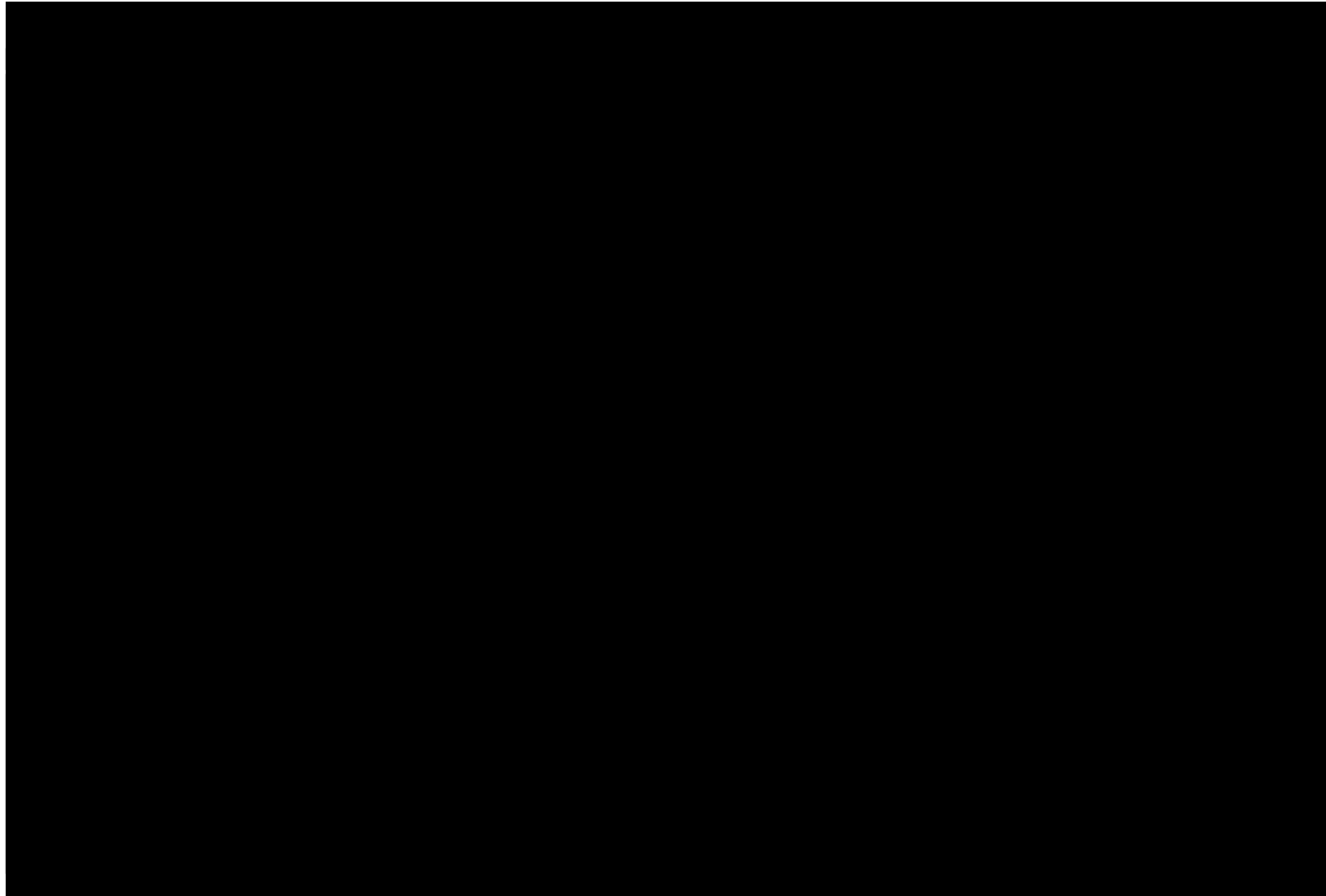












ANNEX VIII: DATA FOR THE TRANSPORT SECTOR IN BURUNDI

The following five tables provide details of the data and calculations that underpin the analysis and projections set out in Chapter 7.

Annex Table VIII.1 provides a summary of the rehabilitation program for each of the 22 national roads. It includes projects that were completed during 2004-2008, projects that are currently ongoing, and proposed new projects. The timetables for the proposed new rehabilitation projects are based on a prioritized list of rehabilitation projects that has been prepared by the Ministry of Public Works and Equipment. A key objective for the program is to complete the rehabilitation of the entire national network within 15 years, and as part of the program pave the entire 1,950 km of the network by 2024.

Annex Table VIII.2 provides a detailed timetable for periodic maintenance of each of the 22 national roads. It includes periodic maintenance programs that have been completed during 2004-2008, those that are ongoing, and proposed new programs for the period 2010-2030. The underlying assumption for the proposed program is that periodic maintenance of each national road would begin within 10 years of start of the last rehabilitation or periodic maintenance program. All the proposed periodic maintenance programs are implemented in a three-year period. The implication is that periodic maintenance is done every seven years on each road in the national network.

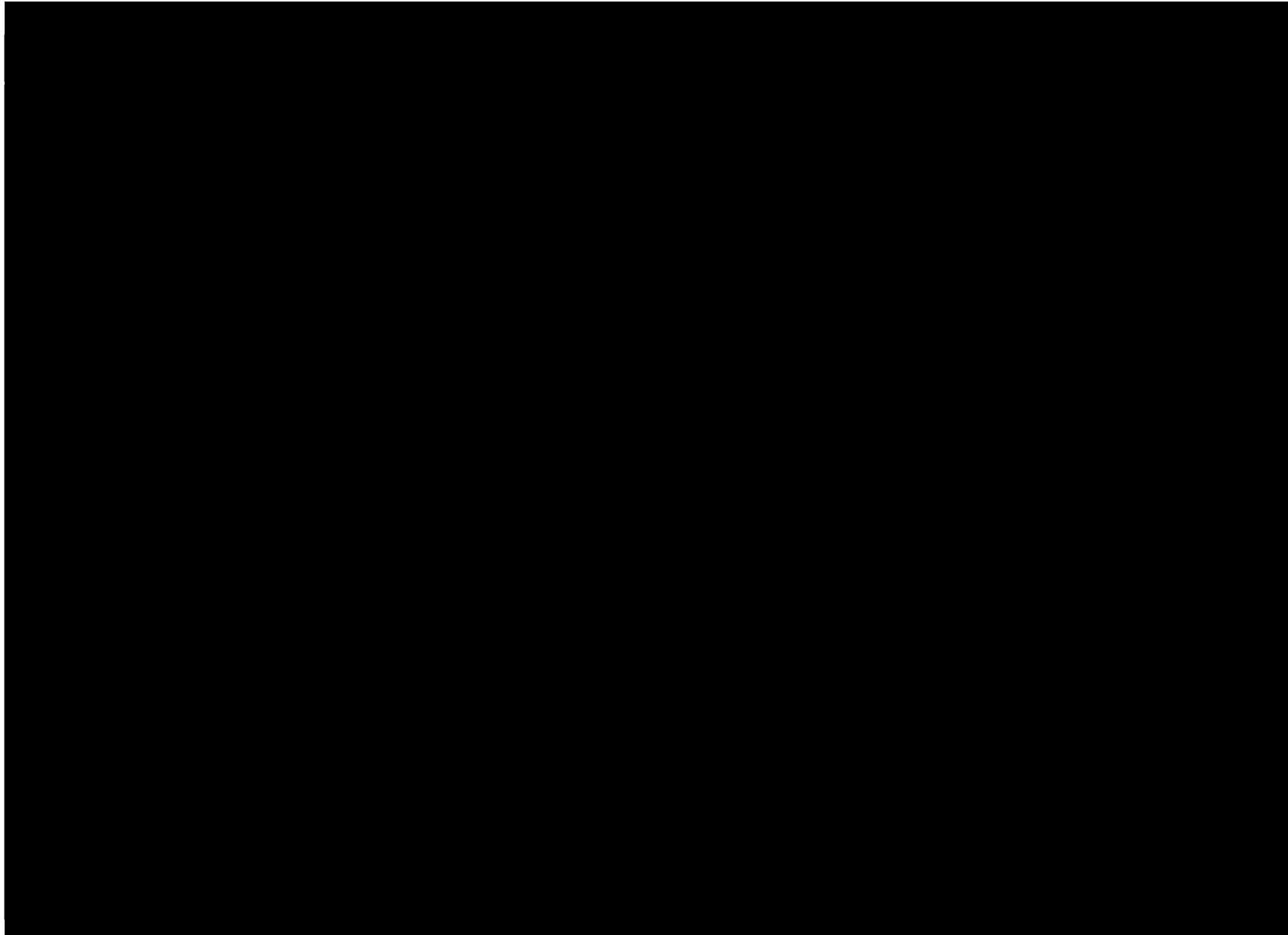
Annex Table VIII.3 provides a summary of the proposed development expenditure program for the roads sector. The various components of the capacity building and technical studies programs for the roads sector are described in Chapter 6. The capital expenditures on the national road network are obtained from Annex Tables VIII.1 and VIII. 2. The assumptions used to calculate the rehabilitation and expansion of the urban road network are given in Annex Table VIII.3, as are the assumptions used for the rehabilitation of the provincial and communal networks.

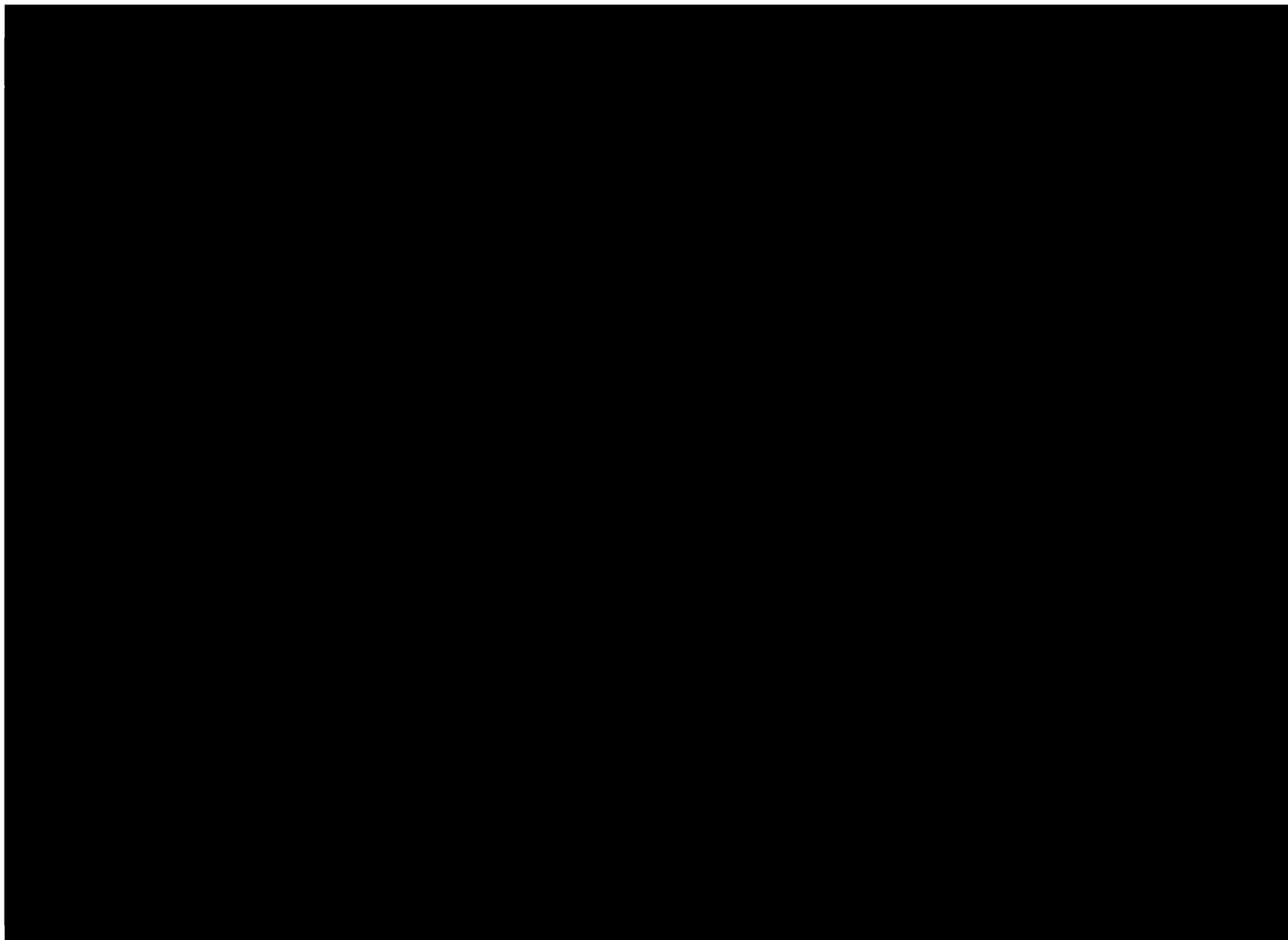
Annex Table VIII.4 provides a summary of the proposed routine maintenance program for the road network. The following assumptions were made about the cost of routine maintenance:

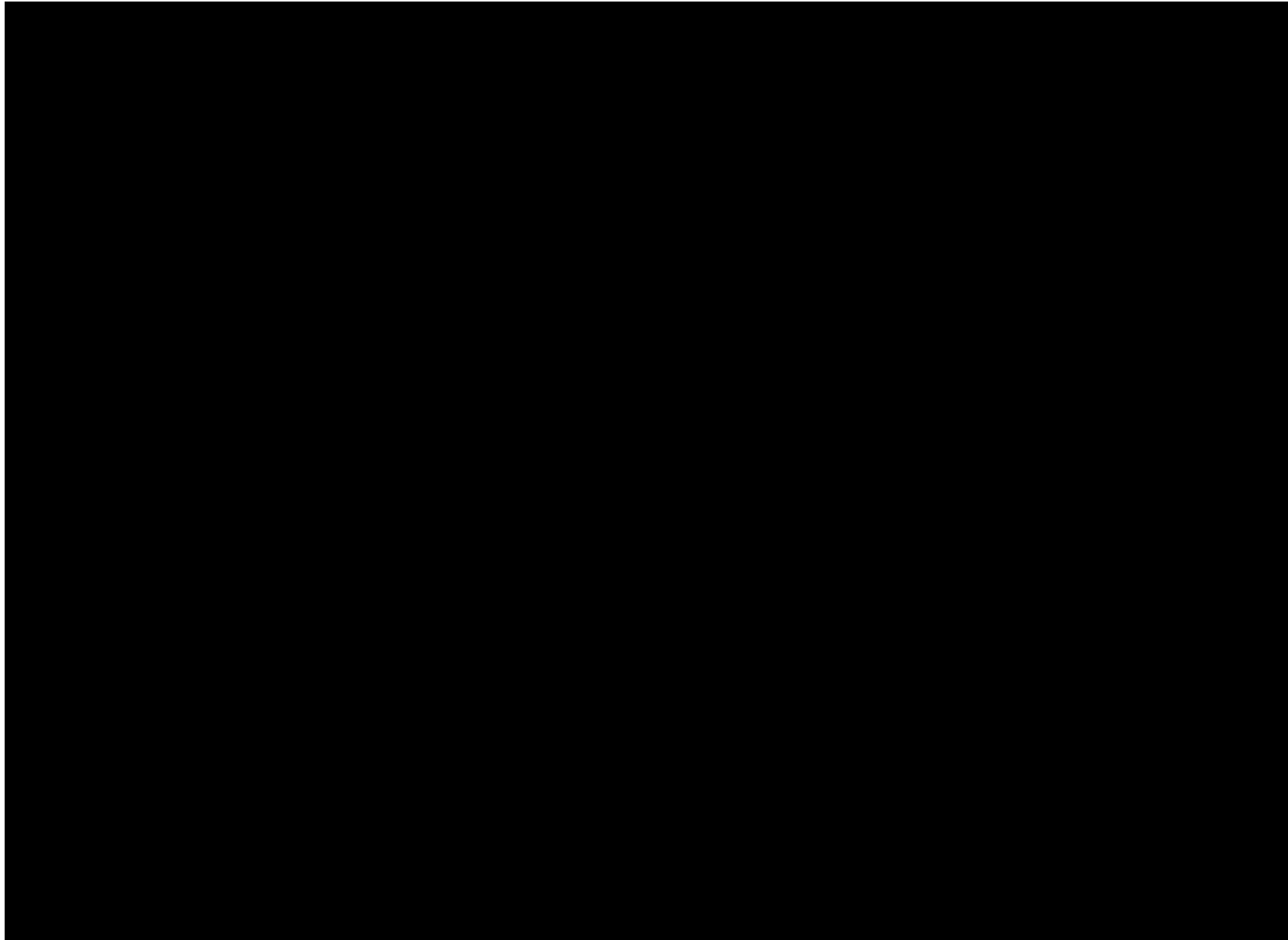
National roads	
Paved	\$1,600 per km
Unpaved	\$2,200 per km
Urban roads	\$2,000 per km
Provincial & communal roads	\$2,000 per km

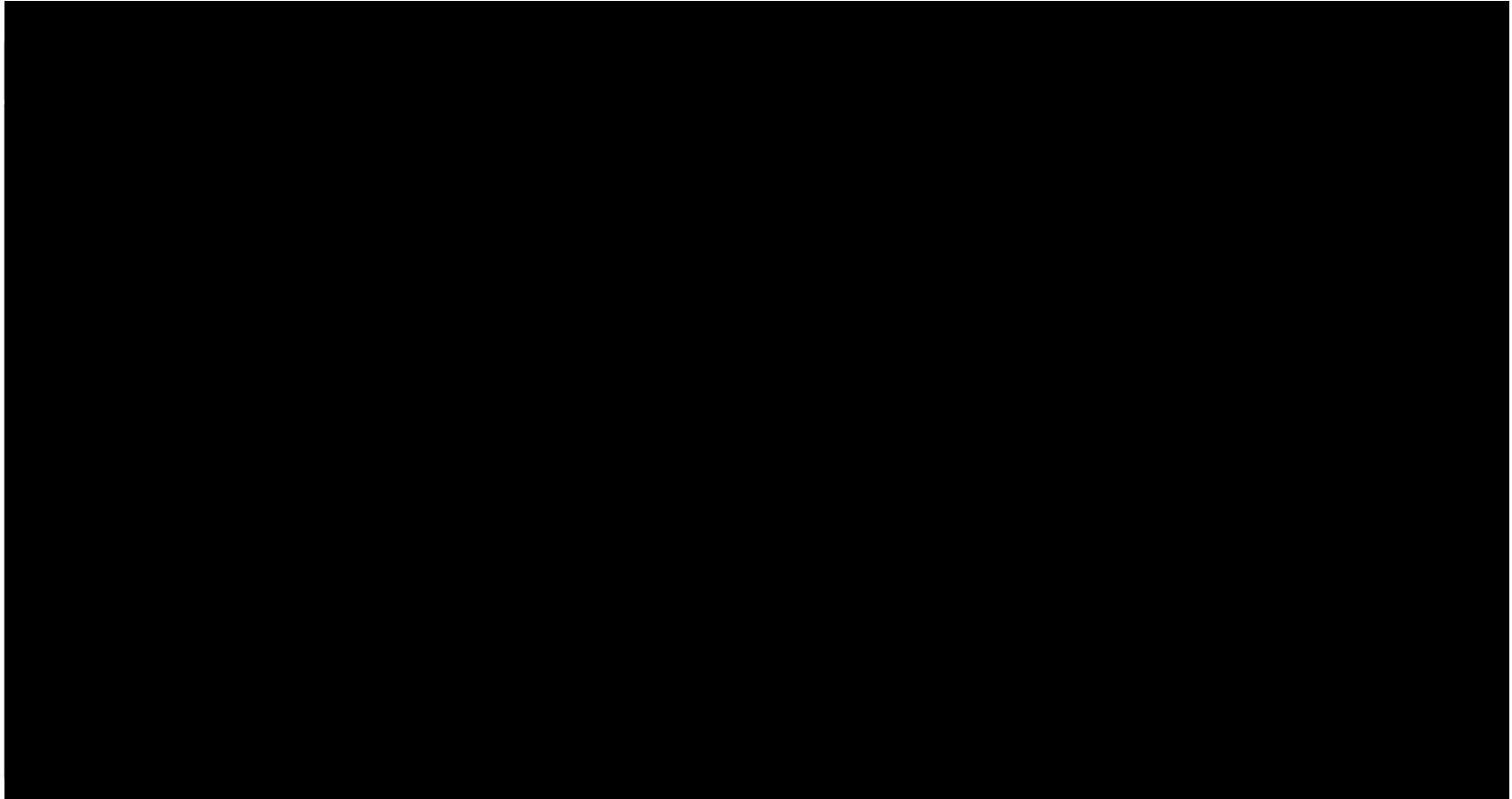
These unit costs are all at 2007 constant prices. The source for these cost assumptions was the World Bank (2008).

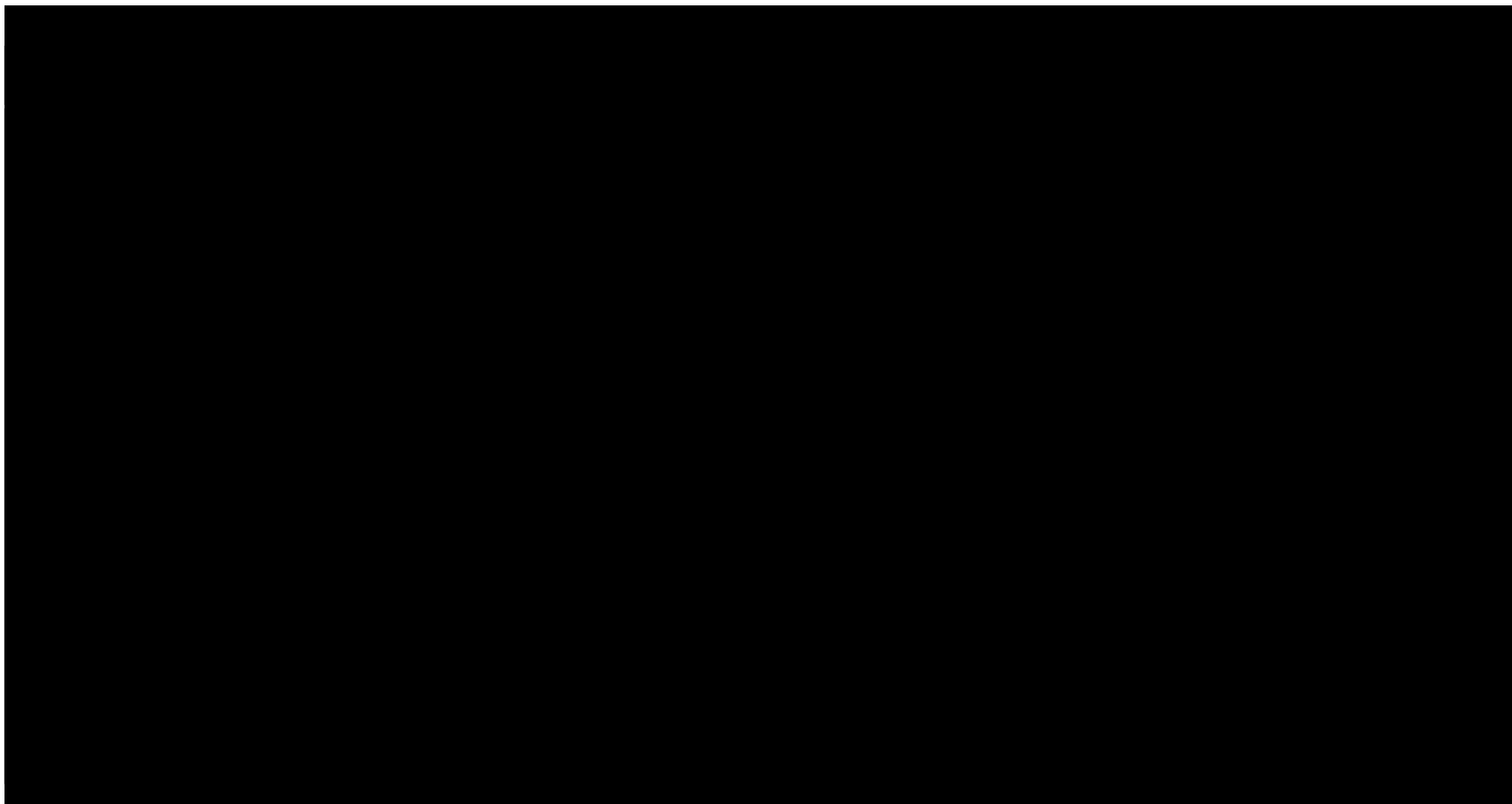
Annex Table VIII.5 and VIII.6 provide the basic information used in Chapter 6 for the cost of the civil aviation and railway extension programs. As the Chapter explains, there are various possible outcomes regarding the rail extension, including one in which the extensions are not built.

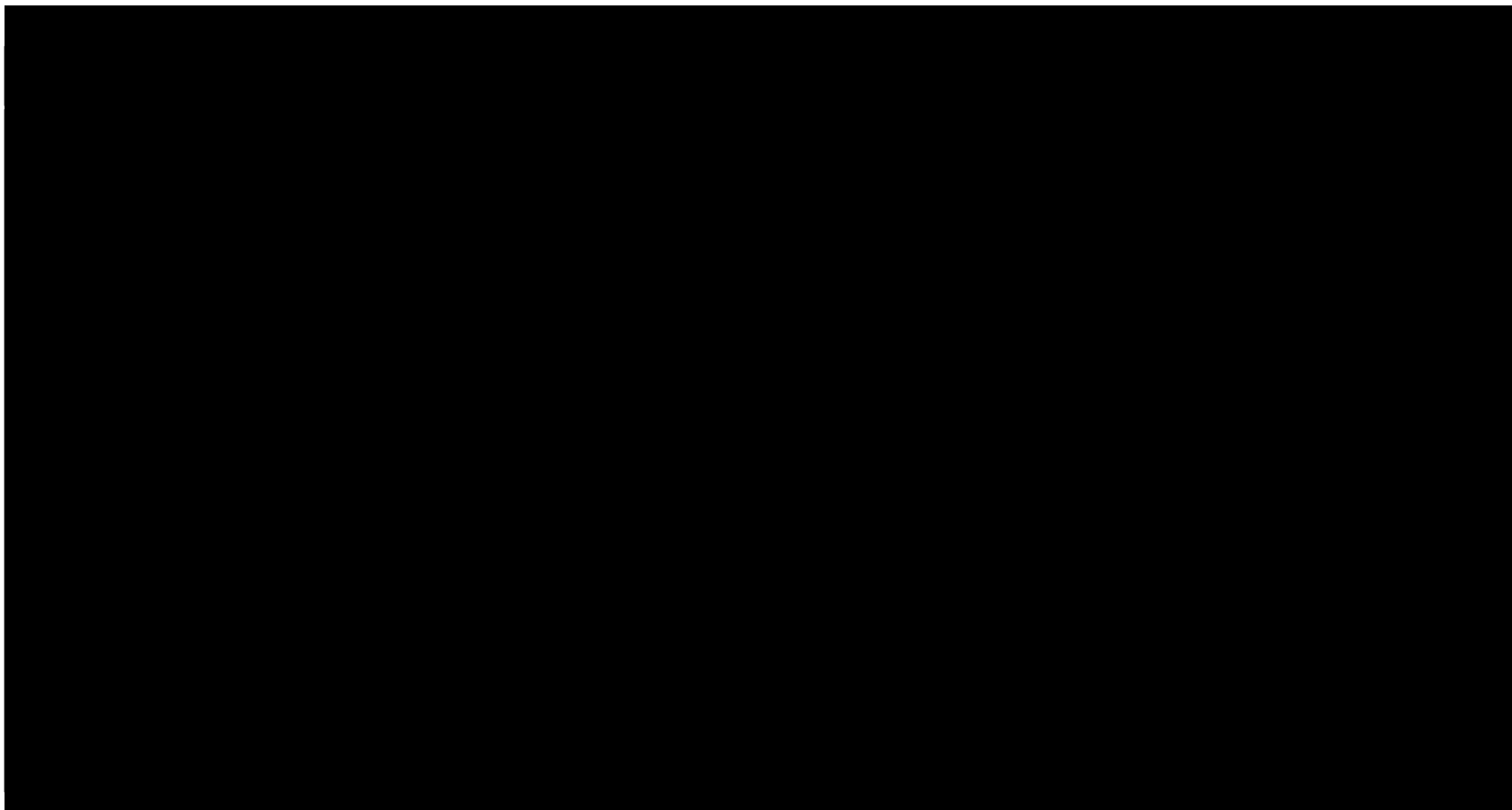


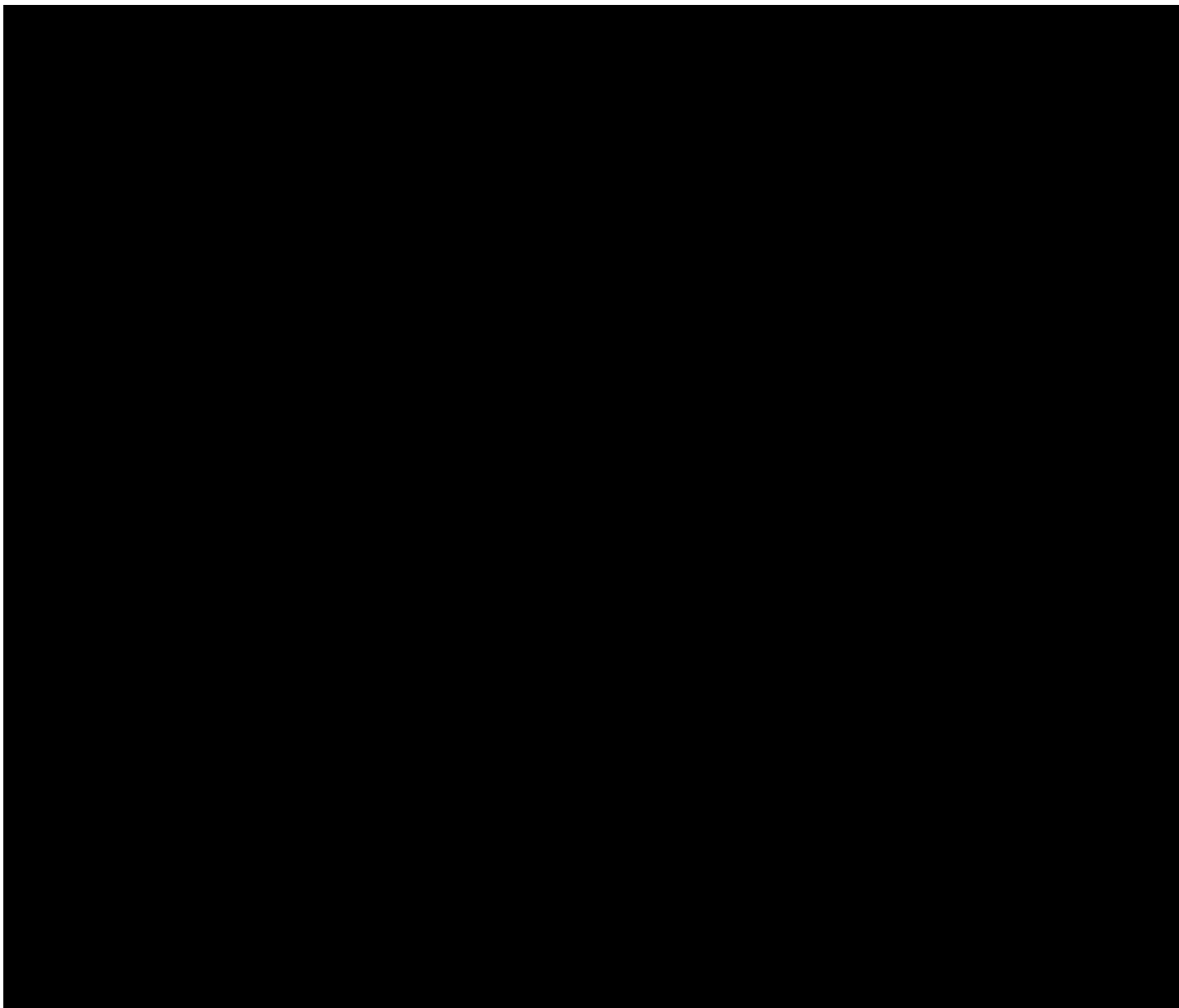




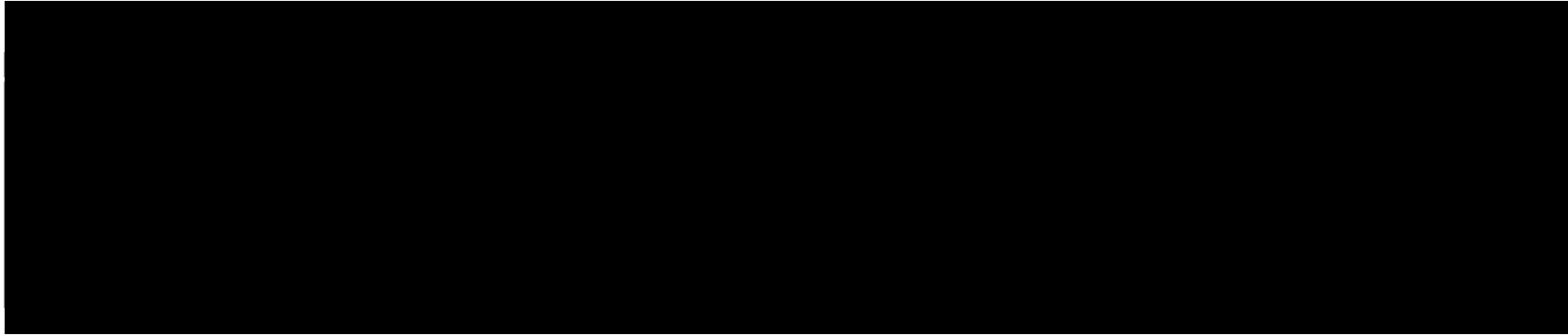


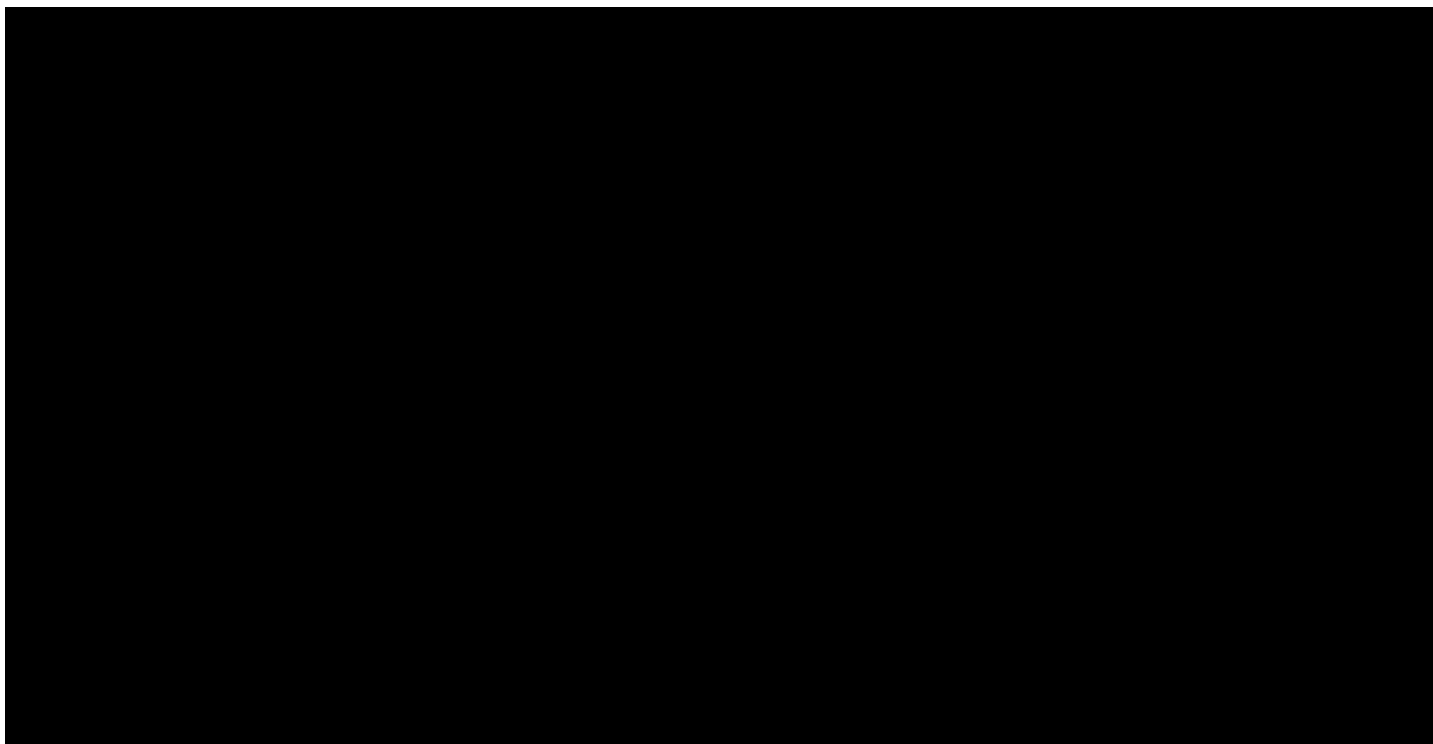


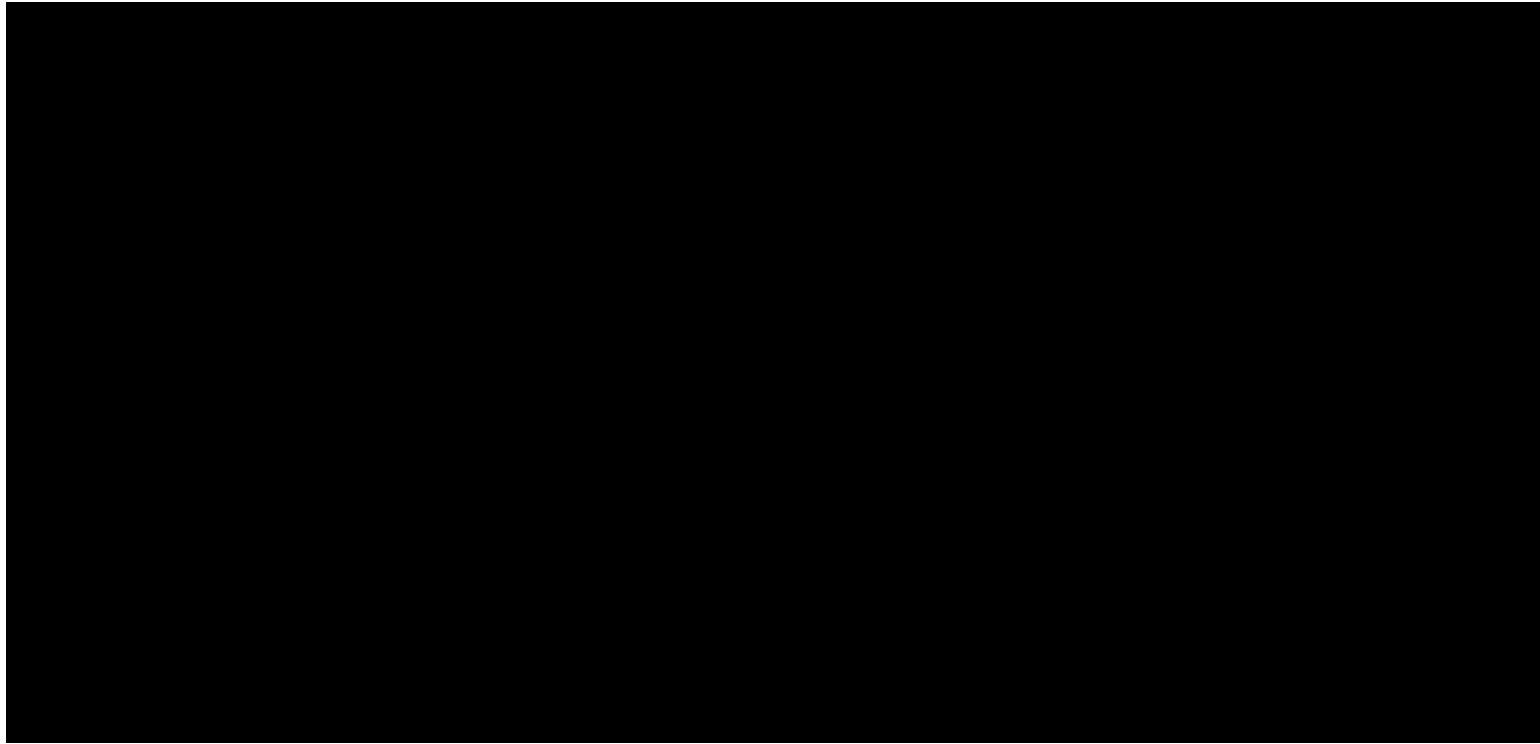


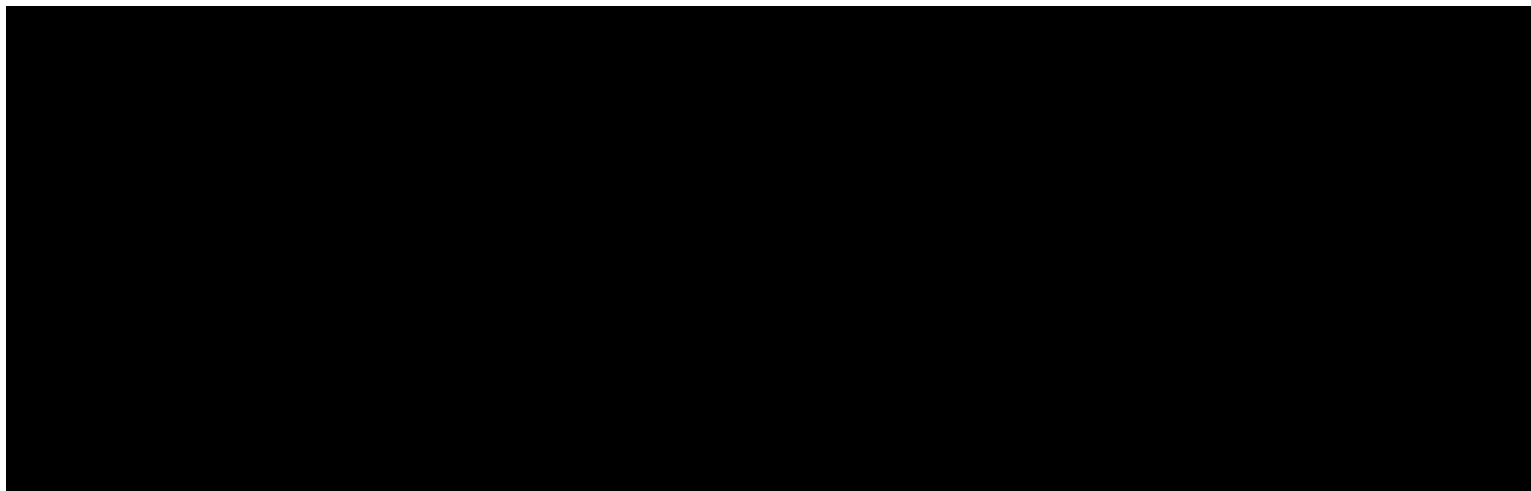
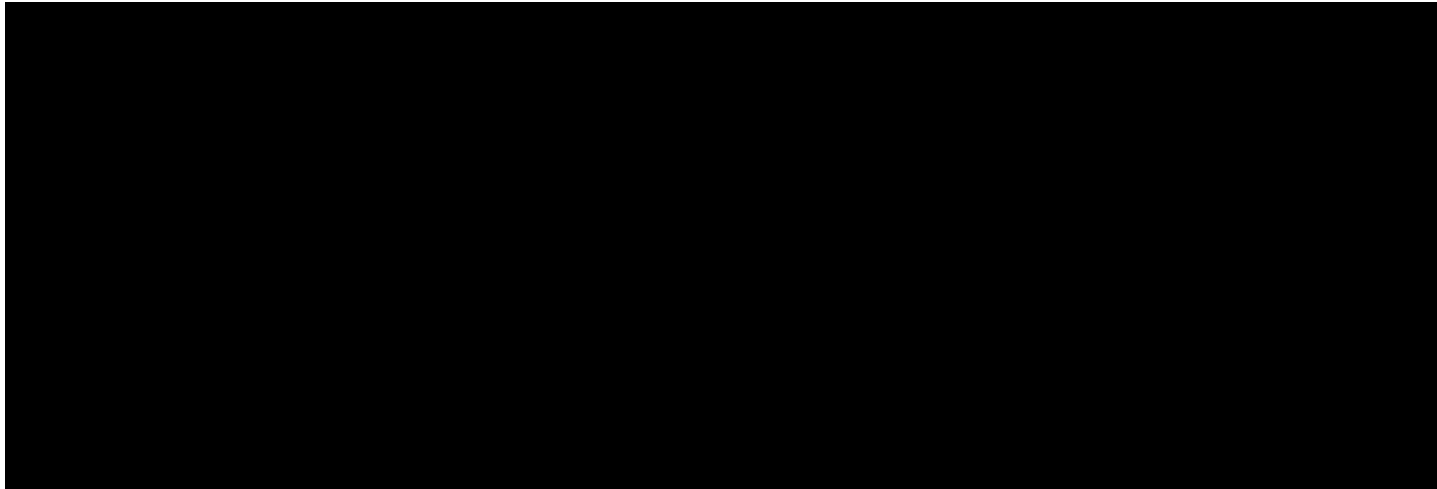












ANNEX IX: DATA FOR THE COMMUNICATIONS SECTOR IN BURUNDI

Annex Table IX.1 sets out the ongoing and proposed expenditure program for the communications sector for 2008 through 2030. The estimates for future outlays by the Government, and donors are notional at this stage as more work is needed under the ongoing donor program on a detailed master plan for further development of the industry. Similarly, the amounts assumed for further investment by private sector operations is notional. The environment and prospects for additional private investment in communications in Burundi is expected to change significantly over the next two to three years as the national backbone infrastructure is completed and complementary services such as electrification are expanded and improved.

