



The Centre for Spatial Economics

**The Economic Impact of
MaRS Discovery District Activities on the
Ontario Economy**

**Prepared for the Ministry of Economic Development,
Employment and Infrastructure/Ministry of Research
and Innovation**

October 2014

Introduction

The purpose of this paper is to present the results from estimating the annual impact on the Ontario economy of ventures that have worked with MaRS Discovery District since inception. The paper presents the assumptions used, the methodology employed to estimate the impacts, and the results for key economic indicators.

The MaRS Discovery District has helped ventures grow and generate economic activity in Ontario in a range of disciplines. Companies that have worked with MaRS since its inception now account for roughly 6,600 direct jobs. The economic impact of these jobs currently is total employment of 7,000 (6,600 direct plus 400 indirect jobs), and, at current levels, annual GDP of about \$1.2 billion going forward.

MaRS Discovery District

MaRS Discovery District advises and provides resources to early stage companies through both its venture client services and through the MaRS Investment Accelerator Fund (IAF). This activity has helped ventures to grow and generate economic activity in Ontario. MaRS clients and other supported ventures focus on a range of disciplines:

- Advanced Health Technologies
- Digital Media and Information and Communications Technologies
- Green Energy Technologies
- Clean Technologies
- Water Technologies
- Agriculture
- Forestry
- Materials and Advanced Manufacturing
- Nanotechnology
- Financial Services
- Other

A combination of data from MaRS' venture client survey, MaRS analysis and reporting provided by MaRS to the Ministry suggest that about 6,662 jobs have been created since MaRS' inception (see attached Appendix for detail on these estimates). The inputs to the impact analysis use these job creation numbers to estimate the direct employment and GDP associated with them. These direct impacts are shown in the table below.

The employment estimates are based on information provided by the Ministry of Economic Development, Employment and Infrastructure. The estimates of GDP at basic prices for each discipline were computed by taking the number of jobs created in the discipline and multiplied by the average amount of GDP per job – labour productivity – in the industry in which the discipline is located.

The first task in this exercise was identifying in which industries the disciplines are found. Almost all disciplines were located in different manufacturing industries. The information on GDP per job for these industries was taken from Statistics Canada's data on GDP and

employment by industry. As can be seen from Table 1, the 6,662 jobs generate 656 million of GDP measured at basic prices in 2014 dollars – or about 718 million at market prices.

Table 1
Employment and GDP (\$2014 Millions) For MaRS Activities

	Employment	GDP
Advanced Health Technologies	1174	122
Digital Media and Information and Communications Technologies	3594	340
Green Energy Technologies	584	61
Clean Technologies	143	15
Water Technologies	78	8
Agriculture	71	5
Materials and Advanced Manufacturing	195	20
Other	824	86
Total	6662	656

Methodology

The approach adopted to estimate the economic impacts is to conduct two projections of the Ontario economy using the C₄SE macroeconomic model of the Ontario economy – see the Appendix for additional information on the model. The first projection, called the ‘base case’, is one in which the MaRS activities have not taken place. The second projection is the one in which the activities have taken place. A comparison of the results of the latter projection with the base case projection for selected key economic indicators provides estimates of the MaRS impacts.

The analysis assumes that there is no increase in population in the province that might be needed to support additional labour requirements. In addition, the cost to the government of supporting MaRS is not accounted for in the analysis. As a result, the positive impact on the provincial government budget surplus of the MaRS project is overstated.

To fully include the impacts of the activities the macroeconomic model is run over a ten year period 2014 to 2024 to allow the activities to feed through the various sectors of the economy. The impact results are computed as the average of the results.

Impacts

The impacts of the MaRS activities on the economy are shown in the tables below. The impacts represent average annual values of the difference between the projection with and without the additional MaRS activities. The economic impact was determined by inputting the total direct jobs number (6,662) in the model assuming these jobs all existed in 2014 and are retained in subsequent years, and estimating the economic impacts over the 2014 to 2024 period. The \$1.2 billion in GDP impact and 7 thousands in jobs impact are then the average annual impacts over the 2014 to 2024 period.

Table 2 presents the results for key economic indicators. Table 3 shows the impact of the MaRS activities on major industry categories in the province. The latter impacts reflect the impacts from the additional inputs required by the MaRS activity industries as well as those induced through impacts of the MaRS activities on consumer spending and investment.

The MaRS activities have a significant impact on the economy. The direct GDP impact of \$656 million of GDP from MaRS activities leads to an additional \$593 million of GDP for the economy for a total impact on GDP of \$1.2 Billion. The increase in employment from MaRS of 6.6 thousand generates an additional 0.4 thousand jobs in the economy. This increased economic activity results in additional consumer and housing expenditures. It also leads to additional investment expenditures in the province needed to supply the production inputs to MaRS and the spin-off effects to consumer and housing expenditures.

Table 2
Impacts for Key Indicators (\$2014 Millions)
(2014-2024 Average Annual Differences)

Real GDP	1248.7
Consumer Expenditure	900.3
Residential Investment	82.1
Business Non-Residential Investment	170.0
Employment (000's)	7.0
Personal Disposable Income	988.4
Federal Budget Balance (\$Millions)	309.8
Provincial Budget Balance (\$Millions)	254.0

The federal and provincial governments also benefit from the additional economic activity. The activity leads to higher personal, corporate, and indirect tax revenues. On average the provincial government sees its budget balance 254 million higher, while the federal government sees an increase of near 310 million.

The impacts on the major industry category GDP measured on a basic price basis are shown in Table 3. These numbers do not add to total as Statistics Canada uses a Chain-Fisher aggregation procedure to add them to total that gives different weights to them in the summation to total GDP. As can be seen from the table, it is the manufacturing industry that sees the biggest impact as it is where almost all of the MaRS activities take place. The service industries see a large increase, in particular, the Finance, Insurance, and Real Estate and Retail and Wholesale Trade industries.

Table 3
 Impacts Major Industry Basic Price GDP (\$2014 Millions)
 (2014-2024 Average Annual Differences)

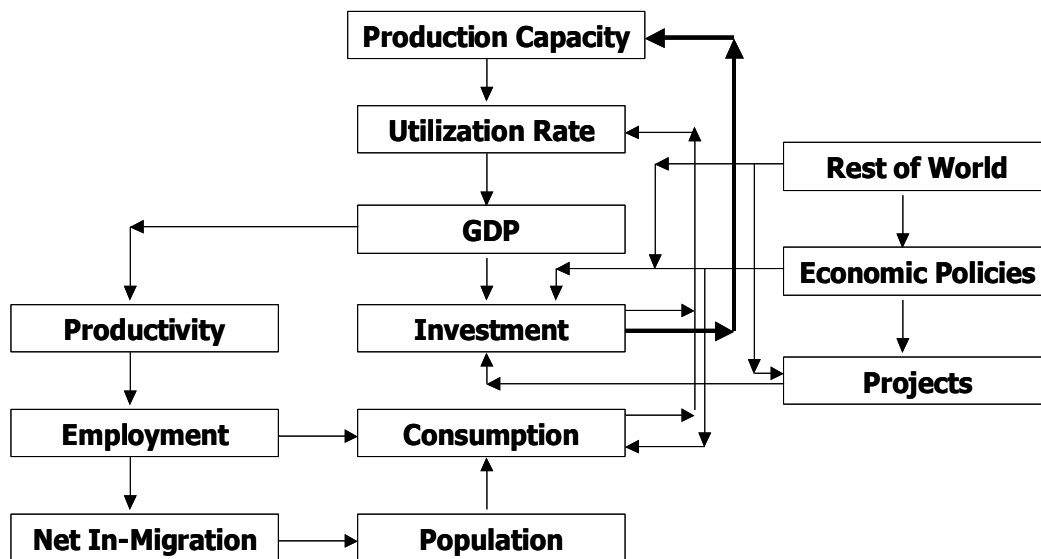
Total	1164
Agriculture	8
Other Primary	0
Manufacturing	632
Utilities	31
Construction	61
Trade	122
Transportation And Warehousing	31
Finance, Insurance & Real Estate	129
PSM	70
Accommodation and food services	20
Other services	60

Technical Appendix

The Centre for Spatial Economics maintains the C₄SE multi-sector provincial economic models. The purpose of these models is to produce medium to long-term economic projections and conduct impact studies. The provincial models are specifically designed to incorporate information on major projects such as the construction of the waste plant in Ontario. To include the projects, assumptions must be set for production output, direct employment and imports. It should be noted that the models are in 2007 base year prices. A base year must be chosen in order to adjust for inflation and determine the “real” growth of the economy.

The provincial models can be characterized as multi-sector (industry) dynamic general equilibrium models. They are KLEM models – capital (K), labour (L), energy (E), and materials (M) are combined to produce gross output in each industry sector. Materials are used in fixed proportion to output while substitution is allowed among capital, labour, and energy. Natural gas and electricity are energy inputs to production. Changes in the relative factor cost of capital, labour and energy bring about the substitution. The production function is Cobb-Douglas for each industry sector.

The basic workings of the models can be seen from the figure shown below.



The main outside forces driving the economy are the influences of the rest of the world and economic policies. These two sets of influences shape the views of local decision makers including the decision to undertake major projects. Real GDP growth, inflation, and interest rates in the rest of the world drive local economic growth through their influence on exports, local inflation, and the cost of credit. Economic policies such as government tax rates and expenditures also impact local growth.

Given the external forces and the production capacity of the various sectors in the economy, firms set capacity utilization rates based on expected sales thereby determining real output.

Once real output for each industry is determined, employment for all industries is set through the productivity of labour. Employment combined with wages, other income, and consumer

prices then determines private consumption. Employment when compared with labour force then drives net in-migration, which in turn sets population growth.

Population growth combined with personal income then determines private consumption. Population also impacts government consumption, as a change in population leads to a change in the demand for government services. Both government consumption and investment are affected.

The increase in real output combined with changes in consumption then changes private investment decisions. The changes in consumption and investment decisions, in turn, lead to changes in capacity utilization rates and output. This type of cycle continues until the one-year solution of the model is obtained.

In the long term, the key determinants of changes in overall economic activity in the model are growth in fixed investment expenditures and productivity growth. The rate of productivity growth is determined by changes in technology and modifications to the way in which business is conducted.

Data Appendix – Estimating Employment at Firms Supported by MaRS

The employment estimates used as input data for the analysis were provided by MEDEI and are based on information supplied to the ministry by MaRS.

MaRS estimates that among all the companies it has provided advisory services or other support to from its inception to early 2014, combined total employment is about 6,662 jobs. This estimate includes only employment at the supported companies and is not an estimate of employment growth across the economy as a result of adoption of technologies developed by these firms.

Detail on jobs created by sector is provided in the chart below.

Table 1: Reported and Extrapolated Jobs Created by MaRS-supported Companies

Sector	Reported Jobs	Extrapolated Jobs	Total Jobs
Cleantech & Physical Sciences	1,176	113	1,289 (19%)
IT, Communications, Entertainment	2,145	1,584	3,729 (56%)
Life Sciences and Healthcare	1,260	384	1,644 (25%)
Total	4,581	2,081	6,662 (100%)

Source: 2013 Venture Client Survey & Report, June 22, 2014, designed and conducted by KPMG.

MaRS-supported companies include venture clients (those receiving business advisory services) as well as those receiving funding through the Investment Accelerator Fund (IAF) program. Job statistics are based on the jobs reported by 58% of respondents to the survey (597 of 1027 companies contacted) and additional information collected by MaRS on IAF recipients.

Reported employment was extrapolated to the full client base using a segmented approach. Average jobs provided within each sector was split into that occurring in ‘high growth potential’ and ‘developing’ companies (unknown growth potential), and applied to non-respondent companies in each sub-segment to estimate unreported job creation. Table 2 shows the number of MaRS-supported companies in each segment and the response rate.

Table 2: Breakdown of Companies Surveyed by Sector

Sector	High Growth Potential Companies (% of Total Responding in Segment)	Developing Company Companies (% of Total Responding in Segment)	Total Companies Responding
Cleantech & Physical Sciences	48 (96%)	71 (79%)	119 (85%)
IT, Communications, Entertainment	165 (67%)	138 (38%)	303 (50%)
Life Sciences and Healthcare	63 (82%)	112 (56%)	175 (64%)
Total	276 (73%)	321 (49%)	597 (58%)

Source: 2013 Venture Client Survey & Report, June 22, 2014, designed and conducted by KPMG.

In addition, MaRS has provided a breakdown of MaRS clients by more detailed primary disciplines in the 2013/2014 fiscal year, as described in Table 3.

Table 3: Number of Unique MaRS clients Serviced According to Primary Discipline

Primary Discipline	2013/14 FY
Advanced Health Technologies (Disciplines 40000, 11000 and 15200)	181
Digital Media and Information and Communications Technologies (Disciplines 11800 and 11900)	554
Green Energy Technologies	90
Clean Technologies	22
Water Technologies	12
Agriculture (Discipline 10300)	11
Forestry (Discipline 10400)	0
Materials and Advanced Manufacturing (Discipline 11100)	30
Nanotechnology	0
Financial Services (Discipline 22300)	0
Other (please create additional rows for each discipline and specify Discipline Code and frequency)	127
TOTAL	1,027

Note: Count each client only once in the most applicable sector.

Source: MaRS Discovery District reported data to the Ministry.

The above breakdown of MaRS clients by primary discipline is roughly aligned with the breakdown of MaRS-supported ventures surveyed by sector, as shown in Table 4.

Table 4: Comparison of Breakdown of Companies by Sector

Sector	MaRS Venture Client Survey Analysis (Table 1)	MaRS Client Breakdown by Primary Discipline (Table 3)
Cleantech & Physical Sciences	19%	15%
IT, Communications, Entertainment	56%	54%
Life Sciences and Healthcare	25%	19%
Other	0%	12%
Total	100%	100%

Source: 2013 Venture Client Survey & Report, June 22, 2014, designed and conducted by KPMG.

To estimate a distribution of the 6,662 jobs by more detailed primary discipline for use in the economic impact analysis, MEDEI staff applied the above distribution to the total number of jobs created (e.g. Jobs in Industry X = 6,662* (Firms in Industry X/1027)). This assumes that the distribution of jobs is the same as the distribution of MaRS clients.

Table 5: Estimated Employment by MaRS-Supported Companies, by Primary Discipline

Primary Discipline	Employment
Advanced Health Technologies	1,174
Digital Media and Information and Communications Technologies	3,594
Green Energy Technologies	584
Clean Technologies	143
Water Technologies	78
Agriculture	71
Forestry	0
Materials and Advanced Manufacturing	195
Nanotechnology	0
Financial Services	0
Other	824
TOTAL	6,662

Source: MEDEI staff estimates based on MaRS reported data.