An example of transport policy assessment in TRESIS 1.4 to reduce greenhouse gas emission in Sydney, Australia

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Abstract. The system wide impacts principle is crucial in public policy formulation. Problems often emerged when decision makers had to decide the optimum policy. This paper discusses the need of an integrated point of view in designing a transport policy. TRESIS 1.4 is an example of a transport policy tool with an integrated assessment between transport, land use, and the environment. The exercised policy applied for Sydney, Australia was based on testing the combined policy (1). Increasing the fuel excise by fuel type (petrol and diesel class 1-10 per L petrol and diesel) by 5% annually in five consecutive years; (2). Increasing the fuel efficiency of current vehicles by 5% annually. The priority of objectives of the policy was related to the environment measurements, i.e. to reduce the greenhouse gas emissions. Findings reported that the combined policy had positive impacts to reduce greenhouse gas emissions (GGE) and energy consumption significantly, but not the ozone (photochemical smog). In addition, the trade-off from the combined policy had cancelled out the losses and benefits for government (revenues neutral) if otherwise the separate policies applied. This exercised policy demonstrated the capability of TRESIS 1.4 in determining the optimal solution based on the assigned priority measurements.

Keywords: TRESIS 1.4, greenhouse gas emission, system wide impact, transport policy.

1. Introduction
Transportation gave the role of mobility in facilitating social interactions and economic transactions [1]. On the other hand, the side effects of transport activities emerged in terms of congestion and environment deteriorations. Congestion happened when the traffic volume reach 90% of capacity [2]. Congestion was believed as a common phenomenon in an urban area, in which the fast urbanization has caused the demand for transportation exceed its supply. A dispersion of residential and work places and an urban sprawl phenomenon were contributed to the risen of the vehicle kilometer travelled. As stated by [3], it is obvious that continued growth of population and industry required some radical changes in transportation and traffic infrastructures.

The cost of congestion (time cost/delay, money cost) emerged in conjunction with the increase of the cost of environment, which consist of three components: air quality (pollution problem), noise generation, and energy consumption [2]. Congestion is linked to the air pollution issue due to slow moving cars produce greater quantities of pollution. Slow moving vehicles increase automotive emissions, and greater numbers of automobiles (that produced greater amount of pollution) are
correlated with demographic growth and traffic infrastructure [3]. In Australia, transport and storage sector account for 29.4 Mt CO2-e or 5.52% of Australia’s net emissions in 2016. Transport emissions has being Australia’s fastest growing sector for greenhouse gases according to the estimated statistics as shown in table 1. These have raised the costs for society. Another example is of the US cases, where SoCAB (South of California Basin) has the worst air quality conditions [3] and traffic congestion costs the state of California as much as $17 billion a year. The area suffers from the economic cost of congestion, the inconvenience of slow transport, and the medical costs of air pollution [3].

Table 1. Detailed Direct Greenhouse Gas Emissions Estimates by Economic Classification in Australia

| Sector                        | Emissions (Mt CO2-e) | Share of total emissions (%) | Change in emissions (%) |
|-------------------------------|----------------------|------------------------------|-------------------------|
| Agriculture, forestry, fishing| 64.3                 | 12.06                        | -74%                    |
| Mining                        | 82.3                 | 15.44                        | 98.3%                   |
| Manufacturing                 | 60.0                 | 11.26                        | -13.5%                  |
| Electricity, gas and water    | 201.2                | 37.75                        | 47%                     |
| Commercial services and       | 34.9                 |                              | 0.9%                    |
| construction                  |                      |                              |                         |
| Transport and storage         | 29.4                 | 5.52                         | 130.9%                  |
| Residential                   | 60.9                 | 11.43                        | 49.7%                   |
| All Sectors                   | 533                  | 100.00                       | -8.5%                   |

Source: [4]

This paper discusses about the need of an integrated point of view between land use, transportation planning and the environment considerations of a transport policy that aimed to reduce the greenhouse gas emissions. While the typical long-term transportation procedure had a significant problem in a joint transportation and land use planning [2], the environment awareness has increased the pressure of environment impact assessment to be integrated in the transport planning as well.

2. A system wide impacts approach

There are several policy types to combat transport problems (i.e. congestion) such as the need to combine supply side and demand side approach [2]. The traditional approach deals with supply side policies, mainly through increasing the infrastructure capacity (new road, road widening, freeway, etc.). Recent approaches emphasized the more cost effective ways, i.e. transport management (Travel Demand Management/TDM and Transport System Management/TSM). However, although transport related impacts to environment already known, the policy between land use and transport planning and the environment policy sometimes were not fully integrated. According to [2], in the USA, up to the 1960s the transport decisions were generally based on the assessment of the capital and operating costs against the expected improvement in the levels of service and travel times. Only until the 1960s, the civil rights and the environment movements contributed to the perspective evolution, i.e. understanding of the role of many indirect socioeconomic and environmental effects of transportation decisions [2].

There is no single solution for transport problems. The assessment of any policy or mixed instruments should be measured as an overall impact [5]. These impacts must be established through a framework that can account not only for the direct/partial impacts, but also the system-wide responses. Similarly, [6] argued that an alternative policy should be examined in an opportunity cost approach and viewed the costs and benefits of solution in a whole system (the total value of production). For example, the proposed policy to combat congestion through exclusion or relocate activities (e.g. works places) that attracts high trips to CBD probably would create urban sprawl in longer terms; hence
generate more vehicle kilometer travelled and more pollution. Similarly, the pollutant payer principle to impose more charge to those who used more pollutant vehicle would raise equity issue since most of low class society only could afford the old car [7].

The raised problem is how one could measure the impacts of a policy decision in a system wide approach? [5] had discussed one example on how a system-wide approach can identify the impact of a specific policy, i.e. a fuel tax increase. Society would have different cope strategies both in the short and longer term. Furthermore, different class of society would have different kind of responds to the policy. For instance, a short term responds maybe in terms of changing the travel time by travelling to off peak period that will require less fuels. Other groups might still have to travel at the same time but they choose to change mode instead (i.e. from car to train). Another direct impact consists of the change in the overall and non-commuting use of each automobile available to a household and automobile type. Furthermore, there are indirect impacts as a result of longer period responds, i.e. a change residential location and a change in the number of vehicles in a household. The policy makers need to consider the fuel tax increase based on the trade-off between the short and long-term impacts, and by putting in balance those costs and benefits of the policy.

To conclude, the integrated point of view between land use, transport, and environment need to be established. An integrated approach is able to measure the trade-off effects of the policies. In the absence of integrated approach model, it is difficult to decide whether the proposed policy would give the optimal results.

3. An overview on TRESIS 1.4

TRESIS stands for the Transportation and Environment Strategy Impact Simulator. TRESIS is designed to support the evaluation of one or more selected policies in the context of land-use, transport and the environment [8]. TRESIS provides transport solutions, through a set of policy instruments that enable policy analyst to (1) identify both the strengths and weaknesses of potential scenarios and decisions; (2) communicate complex ideas effectively; (3) develop strategies and policies that work.

As an integrated model, TRESIS offers users the ability to analyze and evaluate a variety of land use, transport, and environmental policy strategies for urban areas with a wide range of performance indicators/measurements. Some of the output data were listed in table 2 [8].

Table 2. Examples of performance indicators of TRESIS 1.4

| No. | Performance Indicators/Measurements |
|-----|------------------------------------|
| 1   | Travel time by origin zones, destination zones, and TODs |
| 2   | Traffic volume (by origin zones, destination zones, and TODs) |
| 3   | VKM commuting matrices (by TODs, origin zones, and household types) |
| 4   | VKM non work (by TODs, origin zones, and household types) |
| 5   | VKM others (by TODs, origin zones, and household types) |
| 6   | Consumer surplus and accessibility for DTMCM (by origin zones, destination zones, and TODs) |
| 7   | Consumer surplus and accessibility for DTMCM (by origin zones, destination zones, and TODs) |
| 8   | Consumer surplus and accessibility for RLC (by origin zones, destination zones, and TODs) |
| 9   | Energy consumed by alternative fuel (by TODs, origin zones, and household types) |
| 10  | Energy consumed by alternative fuel (by TODs, origin zones, and household types) |
| 11  | Energy consumed by electric vehicles (by TODs, origin zones, and household types) |
| 12  | Energy consumed by diesel vehicles (by TODs, origin zones, and household types) |
| No. | Performance Indicators/Measurements |
|-----|------------------------------------|
| 13  | Energy consumed by petrol vehicles (by TODs, origin zones, and household types) |
| 14  | CO2 generated by alternative fuel based energy consumption (by TODs, origin zones, and household types) |
| 15  | CO2 generated by electrical based energy consumption (by TODs, origin zones, and household types) |
| 16  | CO2 generated by diesel based energy consumption (by TODs, origin zones, and household types) |
| 17  | CO2 generated by petrol based energy consumption (by TODs, origin zones, and household types) |
| 18  | NOx generated by VKM travelled (by TODs, origin zones, and household types) |
| 19  | CO generated by VKM travelled (by TODs, origin zones, and household types) |
| 20  | NMVOC generated by VKM travelled (by TODs, origin zones, and household types) |
| 21  | N2O generated by VKM travelled (by TODs, origin zones, and household types) |
| 22  | End User Vehicle Cost Results (by TODs, origin zones, and household types) |
| 23  | End User cost (by TODs, origin zones, and household types) |
| 24  | End User Time (by TODs, origin zones, and household types) |
| 25  | End User Cost Time (by TODs, origin zones, and household types) |
| 26  | Government Revenue (by TODs, origin zones, and household types) |

Source: [8]

3.1. *TRESIS’s demand system*

The demand system in TRESIS 1.4 was taken from Sydney’s population which was represented by a set of sample. TRESIS 1.4 being used in Sydney with 50 by 50 samples zones system and 672 synthetic households as the sample of population. [8] explained a synthetic household as a sample of households that being introduced into an urban area, where each household being described by a bundle of socio-economic and demographic characteristics. Once a policy or a mix of policies is running on TRESIS, the software inputs the policy selection and the system calculates how the demand and supply system respond to the policy through an equilibration process.

The demand system works through measurements of responds in household level and worker level, subject to the supply constrained. The demand respond would be represented in several aspects, such as residential location choice, dwelling type choice, mode choice, trip timing, work place location, vehicle choice type, fleet size, and automobile use by location. The extent to which each synthetic household give responds to the certain policy would be depend on a weight that carried by each synthetic household [5]. The weight represents each household type’s contribution to the total population. The total demands (i.e. the population responds across all location) for the population will be represented as key matrices, i.e. the accumulation of inter-related impacts across the full set of locations, travels, and vehicles choices made by the synthetic households.

3.2. *TRESIS’s supply system*

The result of the policy was not only determined by what responds emerged from the demand side, but also from the supply side. That was because the system had to make an equilibrium process based on the capacities that were recorded in the supply databases. The supply system consisted of four databases [5], i.e: the transport network, land use zoning, automobile technology/vehicle database, and policy/environment parameters.
3.3. *TRESIS’s demand-supply interaction*

The interaction system consisted of three key procedures to control or equilibrate the three different types of interactions between demand and supply. These procedures are as follows [5]:

- **Equilibration in the residential location and dwelling type market.** Total demand for different dwelling types in each residential location was calculated at a point in time as required. TRESIS 1.4 set 1998 as the base year. It had capability to make prediction in 25 years period. If the demand exceed supply, the excess demand will result in an increase in location rents and dwelling prices, and vice versa. There were some allowance for unused stocks in built in that creating a disequilibrium state. If there were no data on location rents, then dwelling prices for different dwelling types were used to clear the markets for dwelling types and locations.

- **Equilibration in the automobile market.** A vehicle price relative model was used to determine the demand for new vehicles each year. This model controlled the relativities of vehicle prices by vintage via given exogenous new vehicle prices. A vehicle scrap page model was used to identify the loss of used vehicles consequent on vintage and used vehicle prices, where the latter were fixed by new vehicle prices in a given year. The supply of new vehicles was determined as the difference between the total household demand for vehicles and the supply of used vehicles after application of a scrap page model based on used vehicle prices.

- **Equilibration in the travel market.** This was a short-time period responses. If there was a changes in the transport system, households might adjusted their routes choices between origin and destination, or trip timing and or mode choice as a response. Other kinds of responses were included the travel time and cost values between different origins and destinations. In other words, different households can have different choices in responding to changes in different levels of services at different times of day.

4. **The implementation of TRESIS 1.4**

The proposed policy aimed to reduce the environment impact of road transportation, particularly in terms of air pollution impacts especially in terms of greenhouse gas emissions. As mentioned in [2], the major contribution of transportation to air pollution is in the form of carbon monoxide, hydrocarbons, nitrogen oxides, particulate matter, and photochemical smog. Furthermore, the degree of this contribution depends on the emission levels, which were related to vehicle technology, traffic flow levels, and traffic characteristics [2]. Therefore, three classification of strategies related to those aspects were proposed in [2], i.e. technological innovations, improvement in the traffic flow and reduction in the total vehicle miles travel (VMT).

The proposed scenario developed for this paper related to the first type of strategy, i.e. the technological innovation. According to [9], emission problems of motor vehicles are not insurmountable, and are susceptible to technological solution. Strategies in regard to technological innovation could be achieved in several ways, such as utilisation of vehicles that consumed less fuel, or utilisation of vehicles that consumed non fossil fuel. In the scenario building, this paper proposed the combination of strategies such as:

1) Increased the fuel excise by fuel type (petrol and diesel class 1-10 per L petrol and diesel) by 5% annually. This strategy will push market to use more efficient vehicles, or suppose the public desires to reduce pollution sufficiently and move away from fossil fuels, market forces will ensure that a technological solution for emissions from the car will occur and new energy sources will be adopted [9].

2) Increased the fuel efficiency of current vehicles by 5% annually from all vehicles. This scenario was practical based on two things: (a) there is a continuing and growing market for cars that represent a means for relatively fast, efficient, and individualized transport [9]; (b) the availability of current technology made it possible, such as the present of a typical of hybrid technology.
4.1. Selection of relevant measurements

In the sustainable development scenario, the triple bottom of government’s objectives should be achieved from any proposed policies, in terms of efficiency, environment and equity objectives. The environment impacts from transportation sector often emerged in terms of:

- Greenhouse gas emissions (GGE) related to the amount of CO2 that contributed to about 9-26% of GGE.
- Ozone is the most difficult element of photochemical smog to control [3]. Ozone is also contributed to GGE at about 3-7%. Ozone is formed through intermixing of nitrogen oxides (NOx) and reactive organic gases (or volatile organics compound/VOC) [3].

This study specified the most relevant measurements for environment objective are shown in table 3.

| Indicators   | Description                                                                 |
|--------------|-----------------------------------------------------------------------------|
| TCO2         | Total annual carbon dioxide in kilograms, based on 2.35kg CO2 per litre of petrol |
| TNOx         | Total annual nitrogen oxides in kilograms, based on 0.90 grams per vkm       |
| TMNVOC       | Total annual Non Methane Volatile Organic Compounds in kilograms, based on 0.53 grams per vkm |

The efficiency and equity measurements (table 4) will be divided into impacts for government and the users (drivers and society), either the short term or the long term impacts (visible in more than 1 year).

| Efficiency Measurements | Indicators            | Description                                                                 |
|-------------------------|-----------------------|-----------------------------------------------------------------------------|
| Government              | TGovExcise ($98)      | Total government revenue from fuel excise in dollars, from car (petrol and diesel). |
|                         | TPT ($98)             | Total revenue from public transport use in dollars, from all public transport. Fares assumed to remain at $98 levels. |
| Users/Society           | TVKM (km)             | Total annual passenger vehicle kilometres, applied for cars.                |
|                         | TEnergy (litres)       | Total energy consumed by passenger vehicles, applied for cars (petrol and diesel) |
|                         | VehOptCost ($98)      | Total annual auto VKM operating cost in dollars, applied for cars.          |
|                         | TDA (proportion)      | Modal share for drive alone, all person trips                              |
|                         | TRS (proportion)      | Modal share for ride share, all person trips                               |
|                         | Ttrain (proportion)   | Modal share for train travel, all person trips                             |
|                         | Tbus (proportion)     | Modal share for bus travel, all person trips                               |
| Long Terms              | RVehiclePHhld         | Vehicle per household                                                     |
|                         | Class02small          | Proportion vehicle class 2                                                |
|                         | Class05upmed1         | Proportion vehicle class 4                                                |
|                         | Class06large          | Vehicle proportion class 6                                                |
|                         | Class10truck          | Vehicle proportion class 10                                               |
**Table 5.** Indicators for the equity measurements

| Equity Measurements | Indicators          | Description                                                                 |
|---------------------|---------------------|------------------------------------------------------------------------------|
| **Short Terms**     | **TEUC.MC ($98)**   | Total annual end use money cost in dollars, all person trips and public transport fares. |
|                     | **TEUC.Time (min)** | Total annual end use travel time in minutes, all person trips and public transport users. |
|                     | **Mode and departure time** |                                                                              |
|                     | **TEMUDTMC**        |                                                                              |
|                     | **VehOptCost($8)**  | Total annual auto VKM operating cost in dollars, applied for cars.            |
| **Long Terms**      | **TEMURLC**         |                                                                              |

4.2. Model results and discussions

The proposed policy consisted of the combination of increasing fuel excise by 5% annually from the base year (1998) to the next 5 consecutive years (2003) and increasing fuel efficiency by 5% annually in within the same time frame. Without imposing these policies, the amount of CO2 would increase from 8.32 billion kg in 1998 to 8.475 billion kg in 2003 (1.86% growth). Meanwhile, after imposing the policy, the amount of CO2 decreased from 8.32 billion kg to 6.9 billion kg in 2003 (a decrease of –17%), result in -18.56% difference of CO2 before-and-after the policy. On the other hand, the amount of NOx and VOC increased after the policy. If the policy did not applied, the amount of NOx and VOC would increase from 23.9 million kg to 25.2 million kg; and from 14 million kg to 14.85 million kg respectively (5.4% and 6% increased respectively). After the policy imposed, the number of NOx and VOC increased more to about 25.5 and 15.03 million kg respectively (+1.226% and +1.227% in the differences for both NOx and VOC before and after policy applied).

**Table 6.** Before-and-after policy implications: the environment objectives

| Type Of Pollutants | Before Policy (Base) | After Policy (Application) | Differences (%) |
|--------------------|----------------------|---------------------------|-----------------|
|                    | 1998                 | 2003                      | 1998            | 2003       | 1999-2003    |
| TCO2 [kg]          | 8.32 b               | 8.475 b                   | 8.32 b          | 6.9 b      | -18.56       |
| TNOx [kg]          | 23.9 m               | 25.2 m                    | 23.9 m          | 25.5 m     | 1.226        |
| TNMVOC [kg]        | 14 m                 | 14.85 m                   | 14 m            | 15.03 m    | 1.227        |

In terms of the efficiency objectives, the combined scenario would cancel out some of the negative impacts if otherwise the separate policy applied. The average vehicle operating cost after equilibration was decreased by 6.39%. The total end user money cost was decreased by 2.05% while the total end user time cost was decreased slightly by 0.06%. The overall expected maximum utility (or consumer surplus) addition summed across the entire model system was 0.0044% due to the adjustments in workplace and residential location over the 5 year period. However, there was a loss surplus at about 0.27% due to the modal and departure time trip adjustments in the short run. Modal commuter share for automobile trips and ride sharing was increased by 0.17% and 0.16% respectively. On the other hand, the public transport share was decreased by 1.31% for train and 0.96% for bus. The number of vehicle per household was increased slightly over the 5 year period by 0.041%, while the number of vehicle class 02 (small) experienced a decreased by 0.51% compared to other type of vehicles which experienced a slight increased (table 6).

The government revenues from the fuel excise was increased slightly by 1.47% in 2003 due to higher fuel excise but lesser fuel consumption. A decreased in the modal share of public transport caused the total government revenues from transport fares decreased slightly by 1.46%. Total reduction of government revenues by imposing this policy was 2.77% (table 6).
Table 7. Summary results for the combined policy instruments

| Indicators                        | Article II. 5% increase in fuel excise by fuel type | A-spatial strategy 5% increase in fuel efficiency of current vehicles | (1) and (2) |
|-----------------------------------|---------------------------------------------------|-------------------------------------------------|--------------|
| **Greenhouse gas emissions**      |                                                   |                                                 |              |
| TCO2 (kg)                         | -2.42%                                            | -16.57%                                         | -18.56%      |
| **Ozon or Photochemical smog**    |                                                   |                                                 |              |
| TNOx                              | -2.299%                                           | +3.61%                                          | +1.23%       |
| TNM VOC                           | -2.98%                                            | +3.61%                                          | +1.23%       |
| **Auto operating cost**           |                                                   |                                                 |              |
| VehOpCost                         | +12.42%                                           | -16.77%                                         | -6.39%       |
| **Total end user cost**           |                                                   |                                                 |              |
| TEUC.MoneyC                       | +4.068%                                           | -5.39%                                          | -2.05%       |
| TEUC.TimeC                        | +0.43%                                            | -0.36%                                          | -0.064%      |
| **Consumer Surplus Entire model system** |                                               |                                                 |              |
| TEMURLC                           | -0.035%                                           | +2.59%                                          | +0.0044%     |
| Mode and departure time TEMUDTM C | +1.85%                                            | -1.84%                                          | -0.27%       |
| **Passenger vehicle kms**         |                                                   |                                                 |              |
| TVKM (km)                         | -2.298%                                           | +3.61%                                          | +1.23%       |
| **Energy consumption**            |                                                   |                                                 |              |
| TEnergy                           | -2.42%                                            | -16.56%                                         | -18.55%      |
| **Commuter Mode Growth (Propor)** |                                                   |                                                 |              |
| TDA                               | -1.15%                                            | +1.07%                                          | +0.17%       |
| TRS                               | -1.03%                                            | +0.97%                                          | +0.16%       |
| TTrain                            | +8.68%                                            | -8.07%                                          | -1.31%       |
| TBus                              | +6.27%                                            | -5.97%                                          | -0.96%       |
| **Government Revenue**            |                                                   |                                                 |              |
| TGovExcise                        | +21.57%                                           | -16.56%                                         | +1.47%       |
| TgovPT                            | +9.76%                                            | -8.90%                                          | -1.46%       |
| **Number of Vehicles per HH and by class** |                                               |                                                 |              |
| RVehPHHld                         | -0.097%                                           | +0.12%                                          | +0.041%      |
| Class02small                      | +0.745%                                           | -1.09%                                          | -0.51%       |
| Class05upmed1                     | -0.174%                                           | +0.44%                                          | +0.33%       |
| Class06large                      | -0.54%                                            | +0.49%                                          | +0.017%      |
| Class10truck                      | -0.435%                                           | +0.635%                                         | +0.29%       |

The equity objective was specified based on the household income. Increasing fuel excise by 5% when the fuel efficiency increased by 5% annually caused the total annual end user money cost decreased, mostly for those with the annual income greater than 80,000 (decreased by 2.45% after the
policy applied). Meanwhile, the total annual end user time cost also decreased slightly, mostly for those with the annual income between 10,000-30,000 (a decreased of 0.072%). There was no changes in the total annual end user time cost for those with the annual income less than 10,000.

The overall greatest addition of the expected maximum utility (consumer surplus) summed across the entire model system was 0.006% for those with middle to upper annual income (30,000-80,000); while the adjustment in mode and departure time caused lose surplus, mostly for those with the annual income greater than 80,000 (a decreased of 0.275%). Meanwhile, after the policy was imposed, the vehicle operating cost was decreased mostly for those with the annual income greater than 80,000 (a 6.64% reduction).

## Table 8. Percentage changes in the equity indicators based on household income

| Indicators       | less than 10,000 | 10,000 - 30,000 | 30,000 - 50,000 | 50,000 - 80,000 | greater than 80,000 |
|------------------|-----------------|-----------------|-----------------|-----------------|---------------------|
| TEUC.MC [$]      | -2.136          | -2.012          | -1.976          | -2.062          | -2.453              |
| TEUC.Time [min]  | 0.000           | -0.072          | -0.064          | -0.063          | -0.061              |
| TEMUDTMC [$98]   | 0.000           | -0.271          | -0.271          | -0.262          | -0.275              |
| TEMURLC [$98]    | 0.000           | 0.002           | 0.006           | 0.006           | 0.005               |
| VehOpCost [$98]  | -6.254          | -6.283          | -6.342          | -6.473          | -6.641              |

### 5. Conclusion

The system wide impacts point of view has been very useful to identify the best policy that produce the maximum benefits and minimize the negative impacts. In this paper, TRESIS 1.4 brought as one example of a transport tool with that capability, i.e. it integrated transport, land use, and the environment. As it is often very difficult to maximize all benefits at the same time to all parties, one could view the proposed policy with certain priority objectives to be achieved, then identified the impacted winner and loser parties from the policy. Thus, a policy can be carefully evaluated/assessed before it being imposed to achieve better policy outcomes.

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