Research Update on How Combining Universal Law of Location, Game Theory, and GIS Could Contribute to More Informed Land Use Decisions

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Webinar Synopsis

Broadcast and social media reports, academic publications, and research surveys reveal a surge of concern in recent years about the critical need for provincial and municipal politicians to have much more regard for the immediate and long-term spatial impacts of policy and planning decisions affecting Ontario's built and natural environments.

Popular topics of concern include loss of agricultural land, loss of tree canopy, failing infrastructure (roads, sidewalks, sewers), excessive traffic congestion, loss of conservation land, forest fires, both floods and lowering of water tables, waste disposal conflicts, loss of housing type diversity, loss of heritage properties, excessive densification in areas of limited greenspace, and climate change impacts on weather patterns.

Webinar Synopsis (Cont'd)

This webinar presents an update on research into how combining the Universal Law of Location (ULL), zero-sum logic (Z-SL), and the science and technology of geographic information systems (GIS) could assist citizens, politicians, and professionals in government and business make more informed decisions about how and where Ontario land resources are allocated for what purposes.

Sources of evidence include results from surveys of municipal and provincial politicians, scans of broadcast and social media productions, reviews of academic and government literature, and consultations with community activists and GIS and planning practitioners.

Presentation Premise

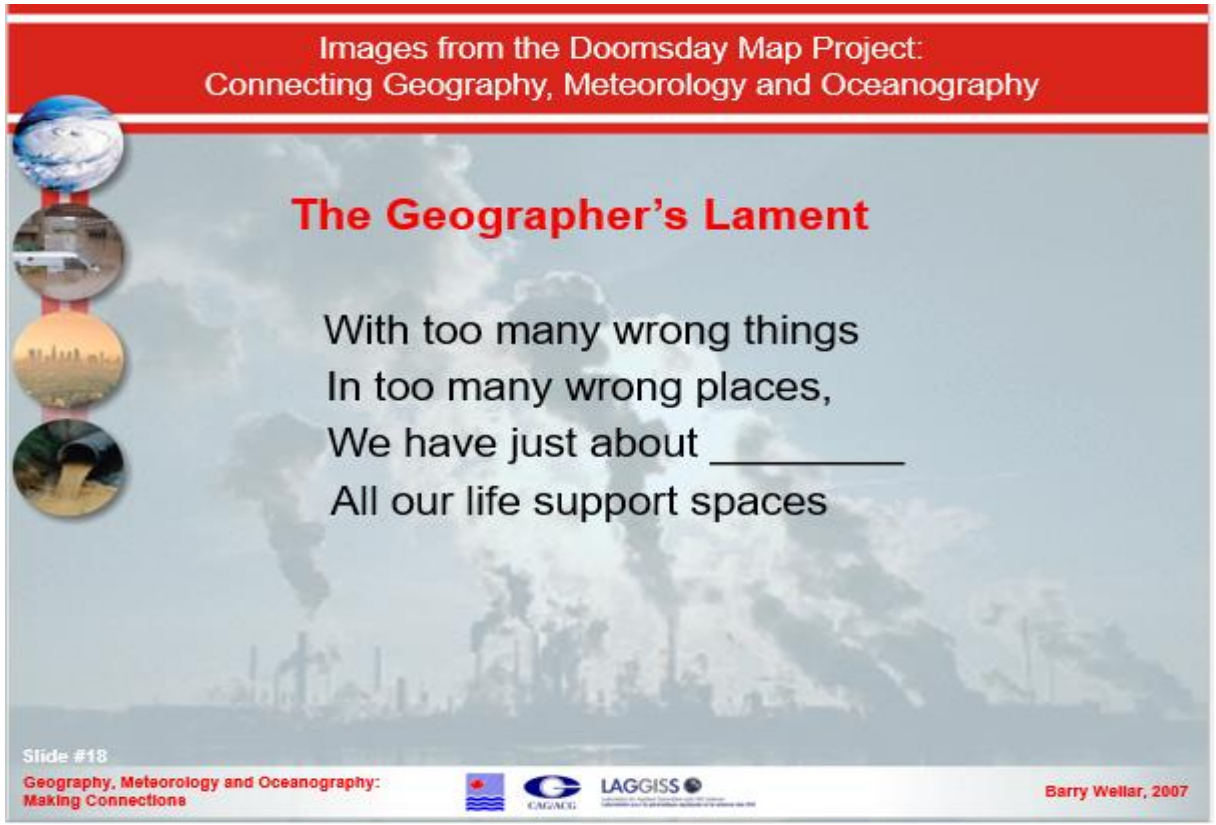
Agencies in the provincial government of Ontario, and municipal governments in the Province of Ontario, MUST make more informed decisions at the earliest moment about which land is used for what purpose, where, and when.

Basis of Premise

Grounds upon which the premise is based include reviews of decades of government, academic, and business research reports, broadcast media reports, and surveys of planning and engineering professionals, politicians, and public interest advocates.

Geographer's Lament. A Doomsday Version of the Presentation Premise

The Lament was initially published in 1990. No disconfirming or counter evidence has been identified.



Robustness of Premise

Based on the evidence contained in the productions comprising the reviews and slides, it is adduced that many, and perhaps even most agencies in the Government of Ontario, and many, and perhaps even most Ontario municipal governments MUST make more informed decisions at the earliest moment about which land is used for what purpose, where, and when.

Presentation Thesis

In combination, the Universal Law of Location, Zero-Sum Logic, and GIS significantly contribute to more informed land use decisions

Design of Thesis Presentation

The thesis design consists of two sets of slides.

Slides 10-27 address the contributions made by the Universal Law of Location (ULL), zero-sum logic (Z-SL), and geographic information systems (GIS) to more informed land use allocation decisions.

Slides 28-44 address the contributions made to land use allocation decisions when the Universal Law of Location, zero-sum logic, and GIS are combined in a decision framework designed to serve and promote more informed decisions by citizens, politicians, and government officials.

Derivation of the Universal Law of Location and Validation

The Universal Law of Location states that something is everywhere, under, on, or above the surface of the Earth.

For test purposes, 8 land-related images of actual, real-world locations under, on, and above the surface of the Earth are presented. The images are numbered for easy identification. The research question is: In which image is there a location where there is nothing?

Derivation of the Universal Law of Location and Validation (Cont'd)

Derivation of the Universal Law of Location and Validation (Cont'd)

Derivation of the Universal Law of Location and Validation (Cont'd)

Previously, similar tests all came to the same conclusion. Nowhere at any location under, on, or above the surface of the Earth is there nothing. Consequently, and as stated by the Universal Law of Location, it is deemed to be confirmed that something is everywhere under, on, and above the surface of the Earth.

Implications of Slides 10-13 for Land Use Decisions

A report detailing a variety of implications is in progress. Ten land use decision situations, slides 15-27, illustrate the implications of the Universal Law of Location for land use decisions.

Since something is already everywhere, the decision to introduce a different land use at any location affects the land use already in place at that location.

Illustrative Implications of Slides 10-13 for Land Use Decisions

A. The campaign promise in 2022 by Ottawa's now-mayor Mark Sutcliffe to add 1,000,000 trees to Ottawa's tree canopy is still on hold until between 28,300,000m^2 and 201,000,000m^2 of land are found to plant the trees.

B. Housing intensification of a neighbourhood means more users of existing land uses such as schools, parks, sidewalks, roads, and bus routes, and/or removal of non-housing uses.

C. Rezoning land from agricultural to non-agricultural use(s) means an increase in land available for non-agricultural use(s) and a loss of agricultural land.

Illustrative Implications of Slides 10-13 for Land Use Decisions (Cont'd)

D. Widening roads means an increase in the amount of land allocated to move people and cargo, and a reduction in land available for non-transportation uses.

E. Underground mining means that a high percentage of rock hauled from under the surface of the Earth and milled becomes waste piles/tailings on the surface of the Earth unless the milled rock is returned to its original location.

F. Decreased recycling requirements and enforcement means more land being used for landfill sites and less land available for other uses.

Illustrative Implications of Slides 10-13 for Land Use Decisions (Cont'd)

G. Converting conservation lands to radar installations, go-cart tracks, or golf courses means that making more land available for non-conservation uses is at the cost of loss of land available for water storage, flora and fauna habitat, and low-impact outdoor recreation.

H. Expansion of urban centers which are not self-sufficient in water requires pumping water from water bodies located elsewhere, which means the need for a long-term recharge capability in the water source area, as well as a water distribution system to link the water sources and sinks.

I. Decisions to expand the built environment upwards and sideways in locations adjacent to existing agricultural land, conservation land, and parkland means changes to the natural environment, including changes to sun access, wind effects, precipitation levels, water retention levels, and shadow effects.

Universal Law of Location Defines the Bottom Line for Land Use Allocation Decisions

The Universal Law of Location underscores the inescapable reality that one land use or another is already in place as part of the built or non-built environment, and that over time decisions to alter land use arrangements frequently become increasingly consequential for land use types that have been the subject of losses to other land uses.

Basics of the Zero-Sum Game Theory Construct

The aspect of game theory pertinent to this presentation is that of zero-sum. Namely, by way of a popular representation in which money is the medium of exchange, the amount of money won or lost by Player A is the same amount of money lost or won by Player B. Or, back in the day, the number of marbles won or lost by Player A is the same number of marbles lost or won by Player B.

Applicability of the Zero-Sum Game Theory Construct to Land Use Decisions

Using land use type as the medium of exchange, for example agricultural land v. residential land, the number of acres that decisions shift from the agricultural land inventory to the residential land inventory equals the number of acres that are removed from the agricultural land inventory and added to the residential land inventory.

Applicability of the Zero-Sum Game Theory Construct to Land Use Decisions

To repeat this scenario due to its existential threat to food security, the number of acres that decisions shift from the agricultural land inventory to the residential land inventory equals the number of acres that are removed from the agricultural land inventory and added to the residential land inventory.

Or to re-phrase, and hence the zero-sum condition, if the acreage of one land use type in increased by 500 acres, then the acreage of one or more other land use types is reduced by 500 acres.

Applicability of Zero-Sum Logic to Land Use Allocation Decisions

The reality is that in the “game” of land use allocation choices, there is a finite amount of land within municipal boundaries and within the provincial boundary for that matter, which means that one land use type can only be increased by taking that amount of land from the inventory of one or more land use types.

Zero-Sum Bottom Line for Decision Makers

The zero-sum construct underscores and emphasizes the inescapable bottom-line reality that in the case of a fixed municipal boundary, or a fixed provincial boundary, increasing the amount of one land type requires reducing the inventory of one or more other land use type(s) by the same amount.

Affirming the Contribution of GIS to Land Use Allocation Decisions

The question put to Google, “Do geographic information systems help make better land use management decisions? yields about 130,000,000 results (webpages).

And the question, “Do geographic information systems help make more informed land use management decisions?” yields about 60,000,000 results (webpages).

Interpretation of Google Search Findings about the Contribution of GIS to Land Use Decisions

Examination of results from both searches reveals overall approval – especially theoretical, speculative, and anecdotal – for using GIS to assist in making land use allocation decisions. When it comes to the empirical aspect, however, while arguments are supportive regarding the use of GIS in a decision support role, it is necessary to acknowledge a limitation.

Limitation to Use of Empirical Findings about the Contribution of GIS to Land Use Decisions

Detailing the significance of the GIS contribution to more informed decision-making is “dicey”, because the methods and techniques of analysis and synthesis used to evaluate the GIS contribution appear to be fairly described as “early stages”. The need is for more robust tests of significance.

Questioning the Grudging Progress to Date of the Contribution of GIS to Land Use Decisions

Scans of productions such as broadcast media reports (newspapers, TV, radio), professional reports, conference programs and proceedings, thesis and dissertation abstracts, academic journals, Official Plan reviews, by-law reviews, provincial legislation critiques, and social media channels reveal that there are likely few jurisdictions in Ontario which are not without need for more informed land use allocation decisions.

A Sample of Headlines Illustrating the Pertinence of ULL, Z-SL, and GIS to Informing Citizens, Politicians, and Staff about the Urgent Need for More Informed Land Allocation Decisions

- Too much farmland is lost to development says expert
- Where will city put garbage in six years?
- Board rules proposed quarry too close to aquifer
- Intensification areas must be served by better transit
- Overdevelopment causing water table drop
- Lack of industrial land means no site for distribution center
- Draining wetlands not a solution
- Too much land taken for roads

A Sample of Headlines Illustrating the Pertinence of ULL, Z-SL, and GIS to Informing Citizens, Politicians, and Staff about the Urgent Need for More Informed Land Allocation Decisions (Cont'd)

- City roads have no space for bike lanes
- Where to locate a new hospital?
- Conservation area overrun by ATVs
- Replace city golf course by bus garage?
- Annex township land for seniors' complex, says mayor
- The floodplain needs to be expanded
- Loss of tree canopy serious problem
- DND parking lot too small

A Sample of Headlines Illustrating the Pertinence of ULL, Z-SL, and GIS to Informing Citizens, Politicians, and Staff about the Urgent Need for More Informed Land Allocation Decisions (Cont'd)

- Crazy to use farmland for radar site
- City wants to expand boundary
- Greenbelt under pressure
- Bury your garbage where you live, says rural council
- Rezoning cropland for housing big mistake, say farmers
- Which lands to take for HSR corridor?
- Why Toronto can't find land for micro shelters
- Two legal battles over Greenbelt records 'likely' quashed by PCs' FOI restrictions

Does Moving Forward Mean a Transformative Paradigm Shift?

Specifically, if perceptions or evidence identify shortcomings in previous land use allocation decisions by municipal, provincial, or federal governments despite the contribution by GIS, and by other decision support tools, moving forward appears to require a transformative paradigm shift so that citizens, politicians, and officials are enabled to make more informed land use allocation decisions and thereby preclude, reduce, or mitigate those types of shortcomings and, perhaps, different or new shortcomings.

Thinking Outside the Box for a New GIS Support Paradigm

GIS applications have a history of more than 50 years, and despite advances in GIS science, technology, education, and training, shortcomings in land use allocation decisions continue to occur. My research suggests that there is need for a top-down paradigm shift for GIS to better inform citizens, elected officials, as well as professional and technical support staff, about how to make more informed land use allocation decisions.

It is Past Time for All Governments to Fully and Actively Respect the Precautionary Principle When Making Land Use Allocation Decisions

Prudent adages, idioms, and proverbs from which the Precautionary Principle is derived have been around for generations. However, the time of casual thinking has long passed and must be replaced by a total commitment from citizens, politicians, and staff to make more informed land use allocation decisions.

A Selection of Adages, Idioms, and Proverbs Illustrating the Scope of the Precautionary Principle and Its Pertinence to Land Allocation Decisions

A stitch in time saves nine; a gram of prevention is worth more than a kilogram of cure; all that glitters is not gold; do not put all your eggs in one basket;
do not count your chickens before they hatch; sooner or later the chickens come home to roost.

More Adages, Idioms, and Proverbs Illustrating the Scope of the Precautionary Principle and Its Pertinence to Land Allocation Decisions

Do not make a mountain out of a mole hill; do not put too many irons in the fire; do not trust those who pursue ends without knowledge of means; err in haste, repent at leisure; failing to plan is planning to fail; haste makes waste; look before you leap.

More Adages, Idioms, and Proverbs Illustrating the Scope of the Precautionary Principle and Its Pertinence to Land Allocation Decisions (Cont'd)

Measure twice cut once; play stupid games, win stupid prizes; prevention is more cost-effective than cure; pump the brakes before heading down a steep hill; the age of miracles is past; there are none so thick as those who will not think; those who throw dirt lose ground; waste not want not; you can't have your cake and eat it too; you can run but you can't hide.

Testing the Adage that a Question Well Put Is a Problem Half-Solved

Could combining Universal Law of Location, zero-sum logic, and GIS contribute to a more informed land use allocation decision process and, consequently, better decision outcomes?

Combining Universal Law of Location (ULL) and Zero-Sum Logic (Z-SL)

Due regard for ULL and Z-SL jointly and severally is more likely to better inform land use allocation decisions than if ULL and Z-SL are applied separately and individually.

Combining Universal Law of Location (ULL and Geographic Information Systems GIS)

Due regard for ULL and GIS jointly and severally is more likely to better inform land use allocation decisions than if ULL and GIS are applied separately and individually.

Combining GIS and Zero-Sum Logic (Z-SL)

Due regard for GIS and Z-SL jointly and severally is more likely to better inform land use allocation decisions than if GIS and Z-SLT are applied separately and individually.

Combining Universal Law of Location (ULL), Zero-Sum Logic (Z-SL), and Geographic Information Systems (GIS)

Due regard for ULL, Z-SL and GIS jointly and severally is more likely to better inform land use allocation decisions than if ULL, Z-SL, and GIS are applied separately and individually.

Moving Forward

The Information Research Board's activity agenda includes surveys of elected officials, professional staff, technical staff, and citizens, as well as literature scans, with emphasis on identifying failed land use allocation decisions that occur as a result of lack of due regard for the Universal Law of Location, zero-sum logic, and/or GIS applied separately and individually, or in combination jointly and severally.

Background Materials

A Selection of Links to Productions Supporting the Presentation Premise

The productions identified in this selection of links contain links and references to many more productions supporting the presentation premise.

Universal Law of Location Supported by GIS as a Best Practice Element in Land Use Planning and Transportation Planning Decision Systems

Universal Law of Location as a Land Use Planning Decision Tool: Analysis of Ottawa Mayor's Pledge to Plant 1,000,000 Trees

Applying Universal Law of Location as a Transportation Planning Decision Tool: Ontario Government Data and Evidence Fail to Support Positions on Gridlock, Congestion, and Removal of Bike Lanes

Applying Universal Law of Location as a Land Use Planning Decision Tool: Ontario Government Data, Evidence, and Research Studies Must be Upgraded to Enable Informed Decisions that Best Use and Preserve the Province's Threatened Farmland Inventory

Background Materials (Cont'd)

Applying Universal Law of Location as a Land Use Planning Decision Tool: Municipal Government Data, Evidence, and Research Studies Must be Upgraded to Enable Informed Decisions that Best Use and Preserve the Province's Threatened Agricultural Land Inventory

Comments on GIS and GeoSkills: New Ways to Achieve New Evidence for Better Decisions

Thoughts about Creating New Risk Assessment Paradigms to Demonstrate How Geographic Factors Affect the Human Impacts of Natural Disasters

Slides for the Closing Presentation: 2019 GIS LEADERSHIP ACADEMY, URBAN AND REGIONAL INFORMATION SYSTEMS ASSOCIATION

Thoughts about Creating New Risk Assessment Paradigms to Demonstrate How Geographic Factors Affect the Human Impacts of Natural Disasters

https://wellar.ca/wellarconsulting/COLLOQUIUM_PROCEEDINGS.pdf

https://www.wellar.ca/wellarconsulting/EsriGISRetroCOLL_PaperDDM_FINAL.pdf

https://wellar.ca/wellarconsulting/New_ESRIseminar2016.html

Esri-Wellar 2015 GIS Retrospective Colloquium

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