

Alternative provincial boundaries for South Africa – a logistical approach

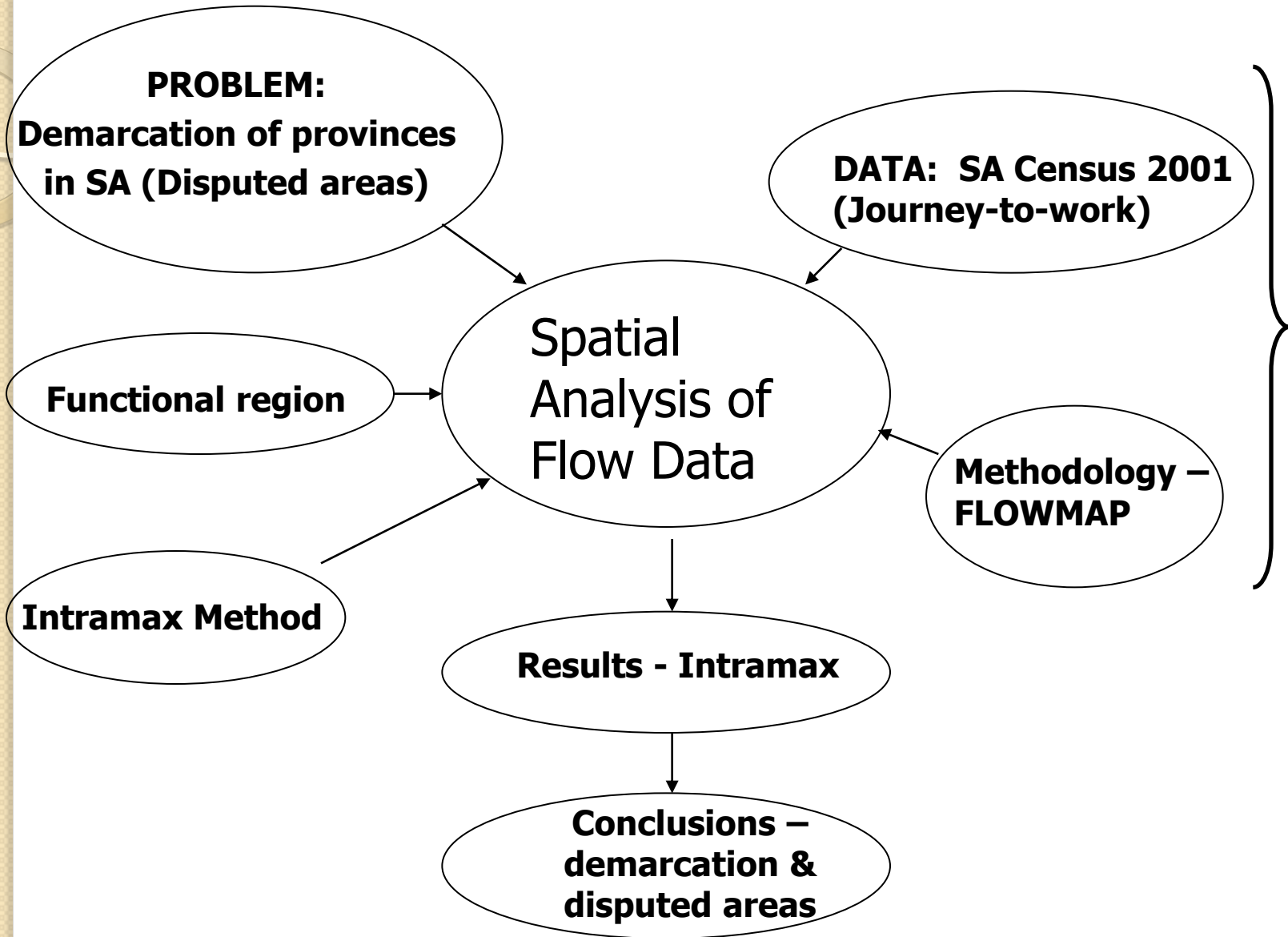
Hannelie Nel*, Stephan Krygsman**
Tom de Jong***

*Department of Logistics, University of Stellenbosch

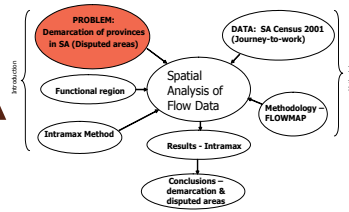
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***Utrecht University, the Netherlands



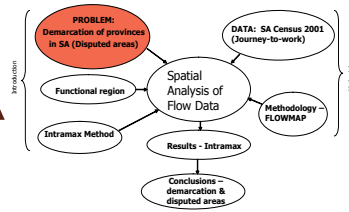


Demarcation of provinces in SA



- Commission of Demarcation of Regions (CDR) was established on 8 June 1993
- After six weeks (31 July 1993) they reached a final decision on the demarcation of the provinces - increased the number of provinces from 4 to 9
- The CDR used the boundaries of the nine planning regions established by the Development Bank (1982-1988)
- They allowed one month for public input and three months for planning afterwards
- Politicians then chopped and swapped magisterial districts to reach a final party agreement

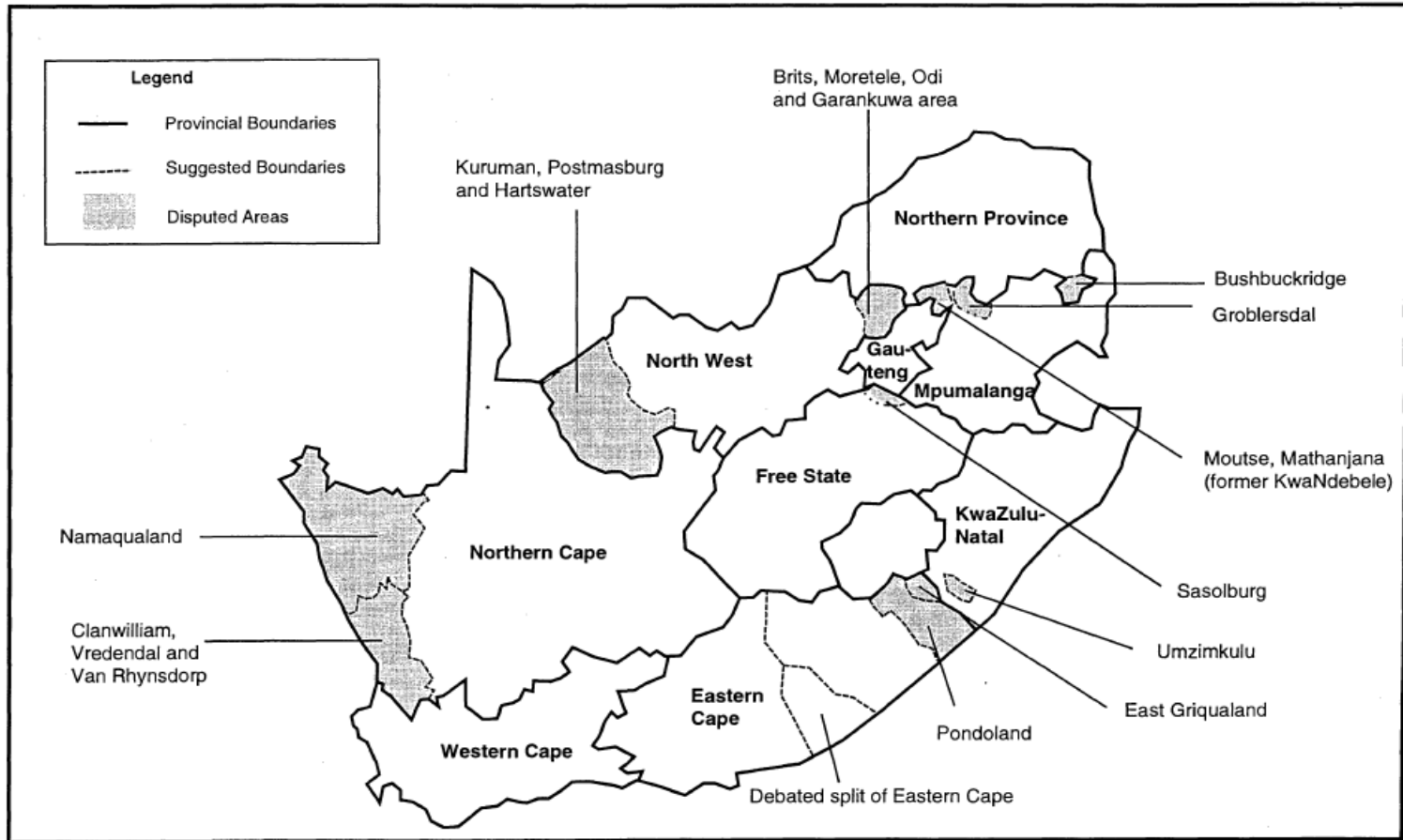
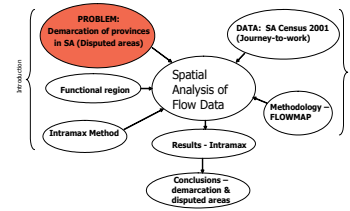
Demarcation of provinces in SA



Two main problems were identified with this process:

- Non-viable provinces - only Western Cape and Gauteng could generate enough income to finance their own administration (Griggs, 1998)
- Disputed areas still exist, 15 years after demarcation process

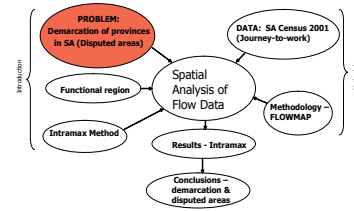
Disputed Areas



Source: Saturday Weekend Argus, 13-14 January 1996

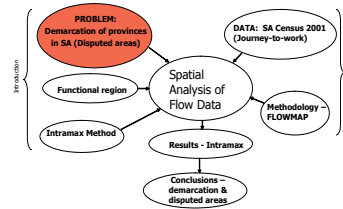


Will SA lose its provinces?



- Two reports in newspapers (Die Burger, 2007), (The Star, 2007) indicated that government considered a reduction of the number of provinces to four or five
- Reports indicated that
 - The feeling is that provinces have hamstrung service delivery as funds meant for municipalities get caught up in the bureaucracy and end up not fulfilling their intended purposes in time, if at all.
 - A discussion document - which moots a four- or five-province option - was drafted and circulated in the government the previous year.

Latest newspaper releases



Tuinroete dalk by die Oos-Kaap ingelyf

JACKIE KRUGER
George

Burger
4 Desember 2010

minder provinsies?

"Oor ons dooie liggame!"

Dit was gister die reaksie van mnr. Theuns Botha, leier van die DA in die Wes-Kaap, nadat die ANC se planne om die Tuinroete moontlik by die Oos-Kaap in te lyf rugbaar geword het.

Kommer is uit verskeie oorde uitgespreek nadat die nuus vandeeweek uitgelek het toe 'n Oos-Kaapse ANC-leier die aap uit die mou gelaat het op die party se be-raad in Midrand, Gauteng.

Volgens inligting word daar gekyk na maniere om die Oos-Kaap se grense te vergroot, onder meer om die provinsie se ekonomie te bevoordeel. Sommige meen egter dit is 'n manier om die ANC se magsbasis uit te brei.

- ♦ Suid-Afrika se nege provinsies – Wes-, Oos-, Noord-Kaap, Vrystaat, KwaZulu-Natal, Gauteng, Limpopo Mpumalanga en Noordwes – kan dalk tot ses verminder word.
- ♦ Mpumalanga kan moontlik tussen Limpopo en Kwazulu-Natal verdeel word.
- ♦ Dele van die Vrystaat kan moontlik by Gauteng en die Oos-Kaap ingelyf word.
- ♦ Dele van die Noord-Kaap kan dalk by die Oos- en Wes-Kaap ingelyf word.

Botha meen niks skort met die potensiaal van die Oos-Kaap se ekonomie nie. "Die blaam vir armoede en agterstande lê alles in politiek. Die Oos-Kaap beskik oor toerisme, uitvoerhawens, 'n landbousector en uitvoermarkte soos die motorbedryf."

Hy het gesê die Tuinroete se ekonomie is na alle waarskynlikheid

kleiner as dié van die Oos-Kaap. "Hulle (die ANC) kan afsny en inlyf soos hulle wil, maar dis nie die oplossing nie."

Sakelui is bekommerd oor die planne, het mnr. Imel Rautenbach, adjunkpresident van die George-sakekamer, gesê. "Dit sal ondernemings in die Tuinroete ontwig omdat baie van hulle op

provinsiale, nasionale en internasionale vlak sake doen. Interaksie van regeringskant speel 'n rol in die proses."

Volgens hom kan nuwe markte egter ontgin word soos wat staatsbronne herposisioneer word.

"Daar is 'n groot behoefte aan dienste soos tegnologie, medisyne en onderwys in die landelike gebiede. Ondernemings met hul tuisbasis in die Tuinroete kan 'n sleutelrol speel in die transformasie van dié gebiede."

Prof. Francois Hanekom, 'n streekkundige van die Suid-Kaap, het gesê 'n dorp soos George is een van die sterkste nie-metropolitaanse groeipunte in Suid-Afrika. "Dit sal 'n juweel in die kroon van die Oos-Kaap wees. So 'n dorp is vir enige provinsiale regering aantreklik."

CAPE TIMES 3 Decem 2010

Garden Route, provinces 'up for grabs'

Carlen du Plessis
Political Bureau

THE Western Cape could lose the lucrative Garden Route to the neighbouring Eastern Cape if plans mooted by some provincial ANC leaders became a reality, while three provinces might disappear altogether.

A senior Eastern Cape ANC leader, who did not want to be named as these proposals were still to be

ANC mulls the possibility of provinces 'disappearing'

From Page 1
large provinces to absorb some of the smaller provinces, especially if it would benefit the economy," he said.

Magashule told the Cape Times yesterday the Free State had been happy in 1994 to be incorporated into a unitary state without provinces.

He said politicians should consider the needs of the people, rather than their own jobs, when discussing these issues.

ANC secretary-general Gwede Mantashe yesterday reminded delegates that

provinces had resulted from the negotiated settlement between different parties in 1994, and although the ANC had preferred a unitary state, it was party to the settlement.

Mantashe, however, said the ANC had wanted the boundaries to be "soft boundaries", which would have meant that people living near the border of one province would be able to access services "close to us" in the neighbouring province.

This was not the case, he said. "Over the years, the provinces have become strong,

and it makes it more difficult to discuss. We should also remember there are people deployed there, and they have become entrenched," he said.

Mantashe also said the cost of service delivery by provincial governments should be considered. Whereas the cost of the legislatures was "negligible", the effectiveness of channelling money through this government sphere should be debated, he said.

DA leaders have already cried foul over the ANC's plans to tamper with provincial

boundaries and powers, saying the ruling party only wanted to diminish the power of opposition parties.

The ANC mooted plans to change provincial boundaries in 2006, and in its 2007 policy conference discussion document mentioned the Eastern Cape and the Northern Cape as provinces which "are struggling" and which "have not made the value-added contribution that was expected".

Other provinces were "middling", in that they were "by and large working", but "their

success rate is still below that expected of an entire sphere of government".

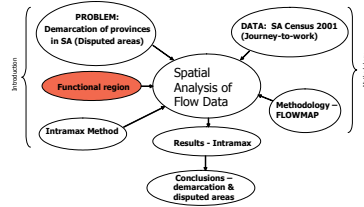
KwaZulu-Natal and the Western Cape were singled out as provinces with "strong technical capacity".

But the two provinces "present special challenges to the ANC politically".

Delegates at the summit are also set to discuss the possibility of a single election date by 2014, when the next general elections are due, as well the future of local and district municipalities.

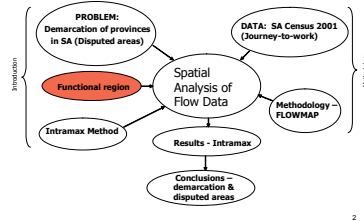
d by delegates
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the meeting said the
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the province's
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aid the party could
reducing the number
nces to six – an idea
ed by senior ANC
ial leaders like Free
remier Ace Magashule
rteng Chief Whip
e Maseko at
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Eastern Cape leader
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Definition of Functional Regions



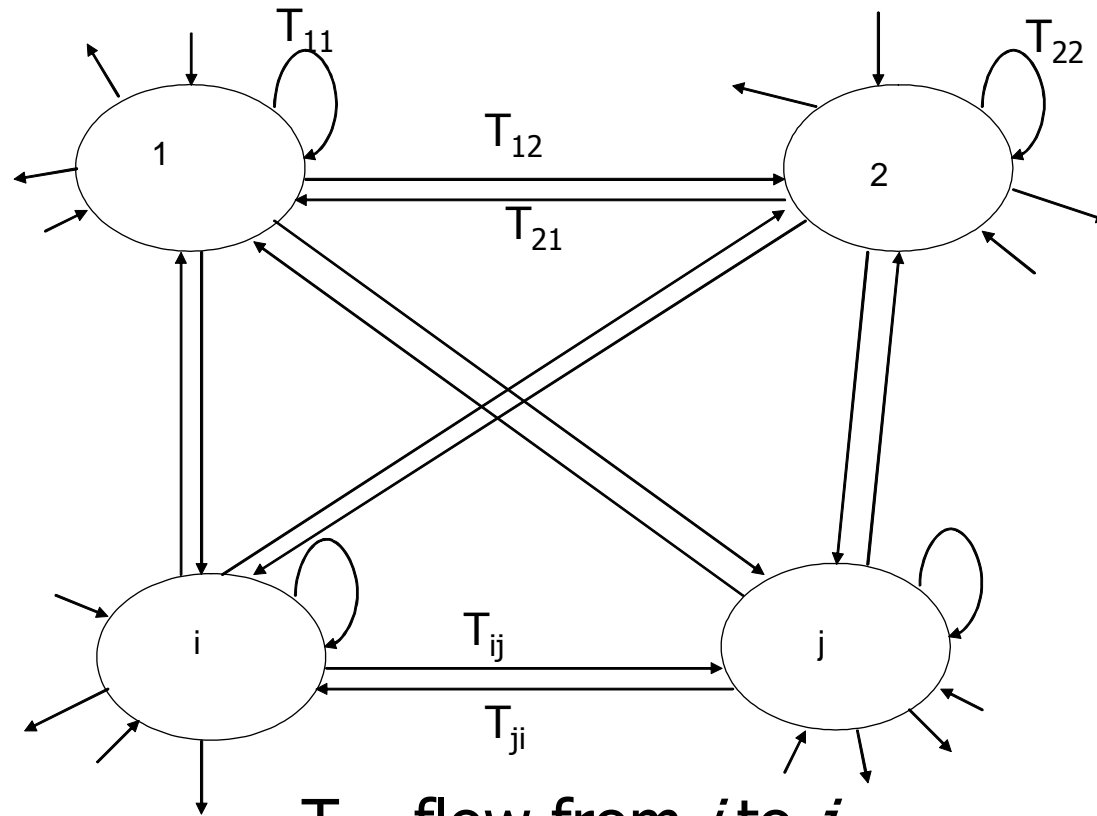
- Functional regions can be defined as regions which have more interaction or connection with each other than with outside areas
- Economic importance: businesses recruit labour force – influence productivity and prosperity
- Political importance: communication, planning, services and administration
- Important for households: households and businesses make activity decisions within the area they are located

Functional Region as function of interaction



- Functional region can be defined by (for example):
 - flow of goods (between origins and destinations)
 - communication flows (e.g. telephone calls)
 - commuting between residence and place of employment/school
 - travel patterns of buyers and sellers (also monetary flows)
 - shopping trips
- Will use journey-to-work data in this application to demarcate functional regions

Development: Intramax

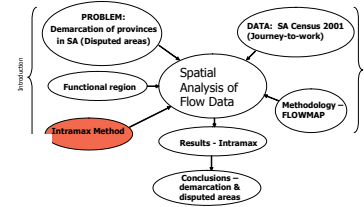


T_{ij} flow from i to j

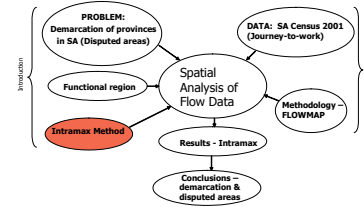
T_{ji} flow from j to i

O_i total flow FROM i

D_j total flow TO j



Development: Intramax

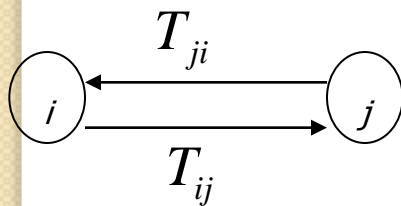


$$O_i = \sum_j T_{ij}$$

is the total outflow from region i

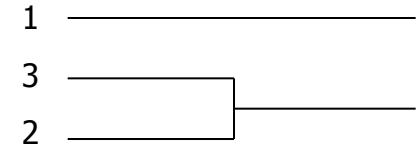
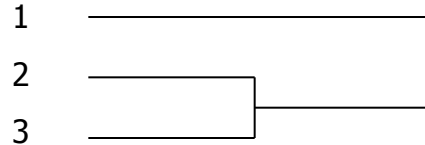
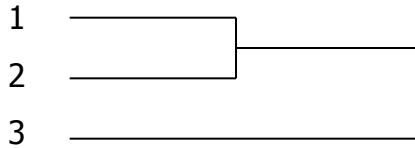
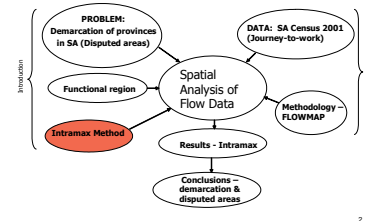
$$D_j = \sum_i T_{ij}$$

is the total inflow into region j



| | Region 1 | Region 2 | ... | Region j | ... | Total |
|----------|-----------------------|-----------------------|-----|-----------------------|-----|----------------------------|
| Region 1 | T_{11} | T_{12} | ... | T_{1j} | ... | $O_1 = \sum_j T_{1j}$ |
| Region 2 | T_{21} | T_{22} | ... | T_{2j} | ... | $O_2 = \sum_j T_{2j}$ |
| ... | ... | ... | ... | ... | ... | ... |
| Region i | T_{i1} | T_{i2} | ... | T_{ij} | ... | $O_i = \sum_j T_{ij}$ |
| ... | ... | ... | ... | ... | ... | ... |
| Total | $D_1 = \sum_i T_{i1}$ | $D_2 = \sum_i T_{i2}$ | ... | $D_j = \sum_i T_{ij}$ | ... | $n = \sum_i \sum_j T_{ij}$ |

Development: Intramax



Given k subsets, reduce to $(k-1)$ subsets by considering the union of all possible $k(k-1)/2$ pairs that can be formed. Accept the union with which an optimal value of the objective function is associated.

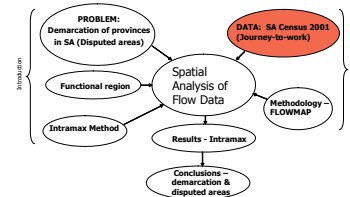
Brown & Pitfield (1978) objective function:

$$\text{Max}_{i \neq j} z = \frac{T_{ij}}{O_i D_j} + \frac{T_{ji}}{O_j D_i}$$

Identifies regions which have more direct interaction with each other than with other areas at each stage of the grouping process



Data: SA Census 2001 (Place of work)



ANY WORK IN THE 7 DAYS BEFORE 10 OCTOBER (P-18)

In the SEVEN DAYS before 10 October did (the person) do any work for PAY (in cash or in kind) PROFIT or FAMILY GAIN, for one hour or more?

1 = Yes: formal registered (non-farming)
 2 = Yes: informal unregistered (non-farming)
 3 = Yes: farming
 4 = Yes: has work but was temporarily absent
 5 = No: did not have work

If YES go to P-19

PLACE OF WORK

(P-19e) (P-19f)
 If YES to P-18

Does (the person) work in the same sub-place in which s/he usually lives?
 Y = Yes
 N = No
 Dot the appropriate box.

PLACE OF WORK

(P-19e) (P-19f)
 If YES to P-18

Does (the person) work in the same sub-place in which s/he usually lives?
 Y = Yes
 N = No
 Dot the appropriate box.

If NO, where is this place of work?

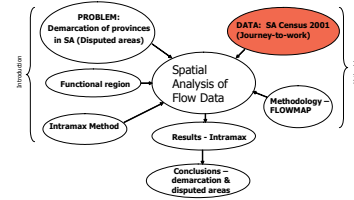
If NOT the same place, write PROVINCE **P R** ,

Note to users

The question was asked 'In the SEVEN DAYS before 10 October did (the person) do any work for PAY (in cash or in kind) PROFIT or FAMILY GAIN, for one hour or more?'

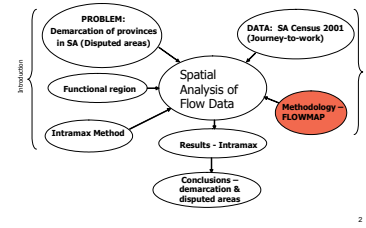
Enumerators were instructed that the definition of work includes formal and informal work, farming, food production and food gathering, seasonal work (e.g. farm workers or other people who work only during a specific season), casual or piece work, selling vegetables or running a spaza shop.

Data – SA Census 2001



- Contained a question on where do people work
- Recorded all people, aged 15 to 65, main place of stay, and main place of work
- 28 427 129 people between 15-65 years of age. Approximately 9 million persons were included in the final database – employed with main place of work properly matched.
- “Flows” between all possible main places (T_{ij} and T_{ji}) are calculated (approximately 3100 main places).

Methodology: FLOWMAP

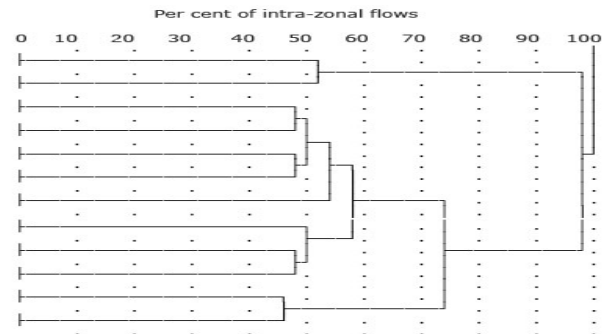


- FLOWMAP was developed by Utrecht University, the Netherlands
- It applies Intramax to combine regions into functional regions at different stages based on the strength of the interaction between the regions, while taking account of the variations in the row and column totals of the matrix.

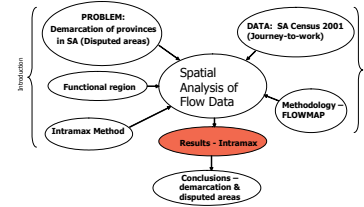
- Output:
Dendrogram
Map



| | |
|-----------|---------------------|
| 105703100 | Gosford |
| 105708550 | Wyong |
| 110051720 | Cessnock |
| 110107000 | Singleton |
| 110102700 | Dungog |
| 110055050 | Maitland |
| 110056400 | Port Stephens |
| 110054650 | Lake Macquarie |
| 110055901 | Newcastle-Inner |
| 110055902 | Newcastle-Remainder |
| 110105650 | Muswellbrook |
| 110106800 | Scone |

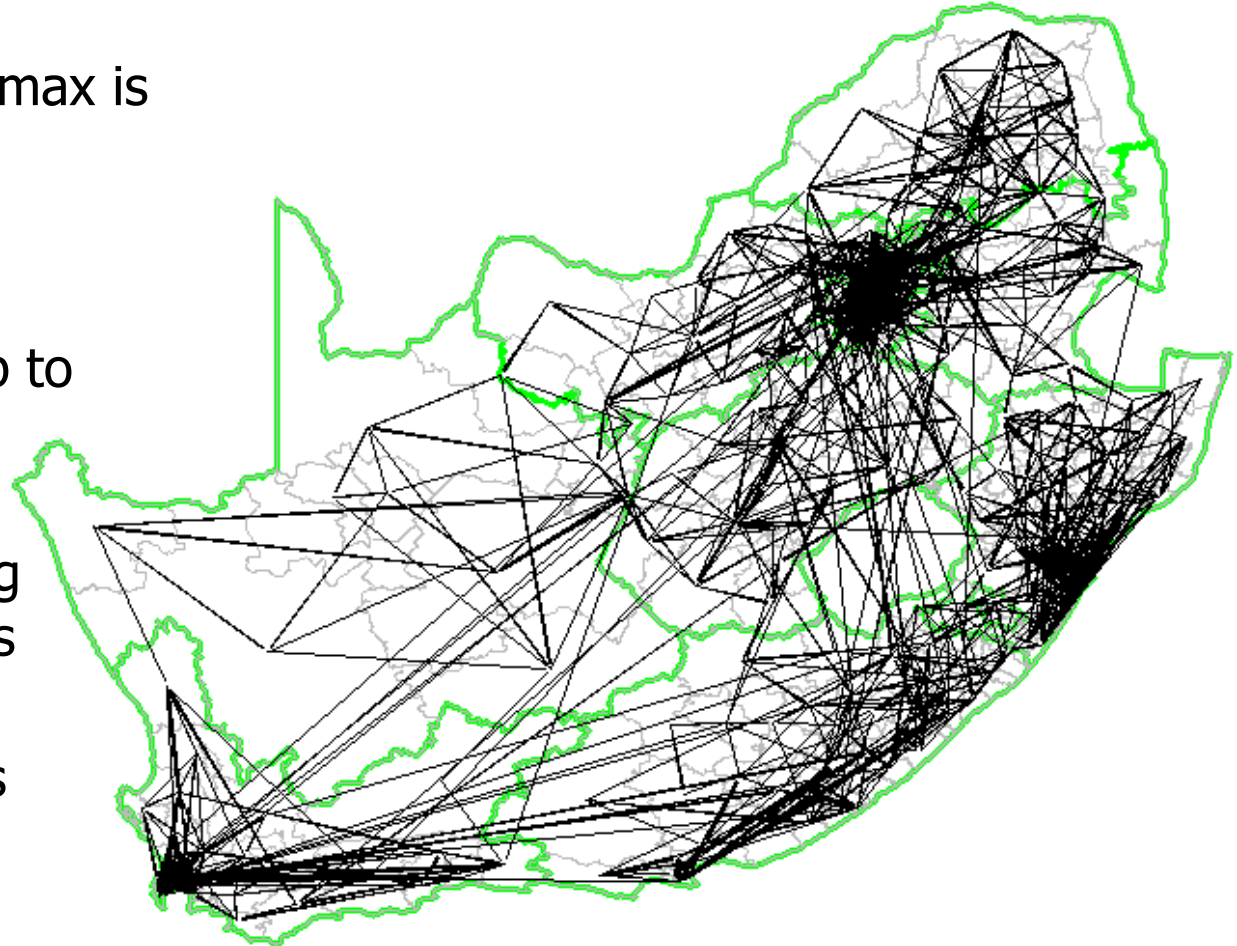


Results: FLOWMAP

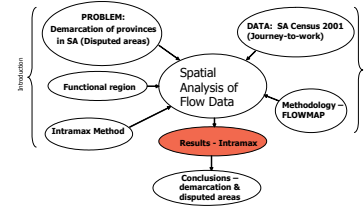


Flows before Intramax is applied:

- Long distance commuting – up to 1700km daily commuting
- Daily commuting between metro's
- Non-contiguous functional zones

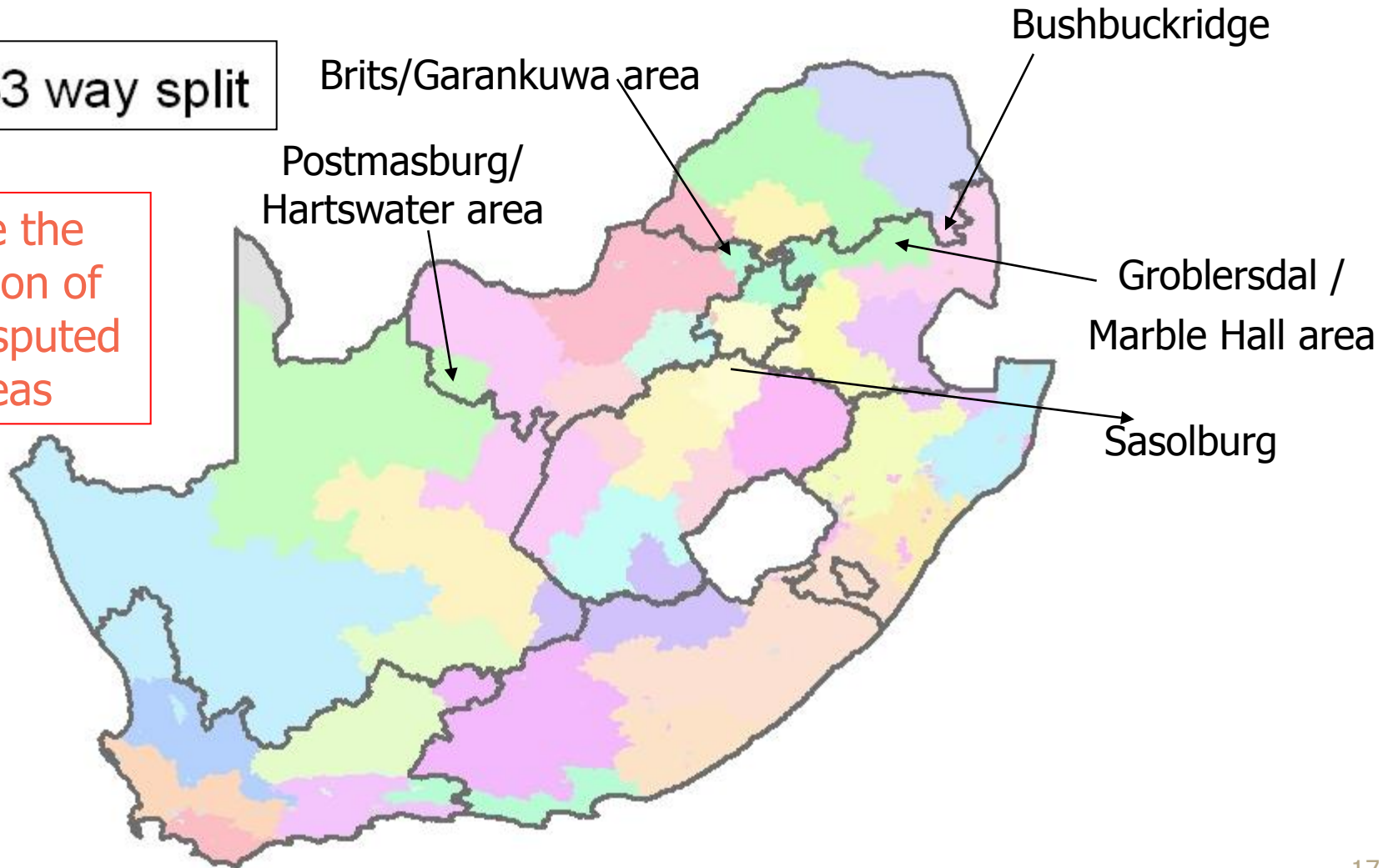


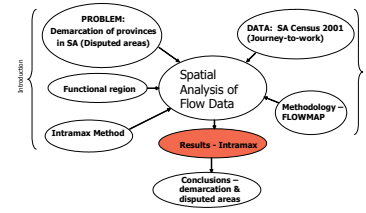
Results: Intramax



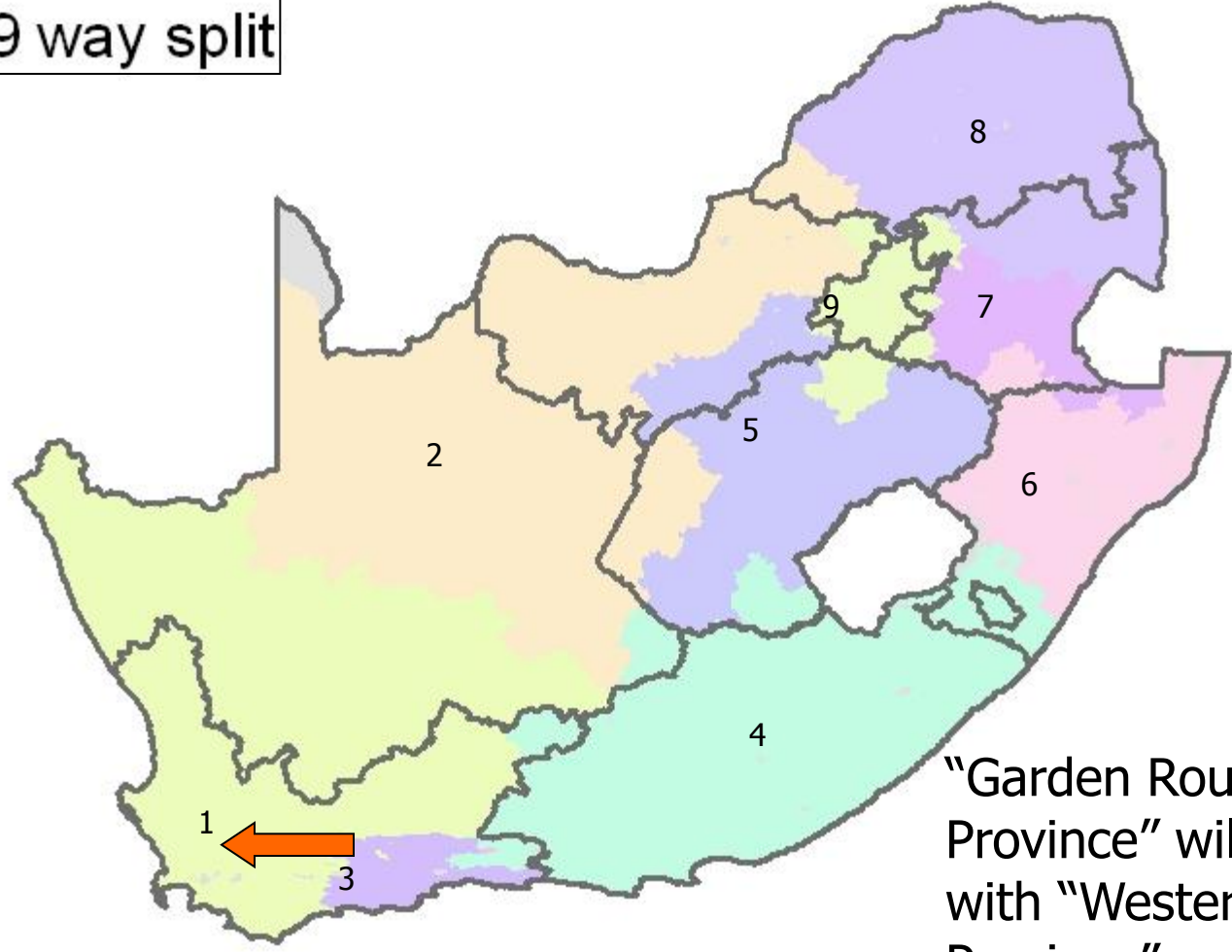
33 way split

Note the location of the disputed areas



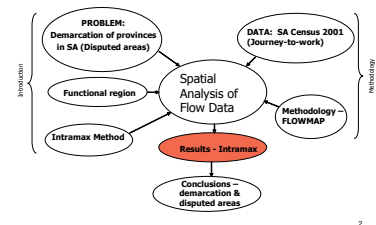


9 way split

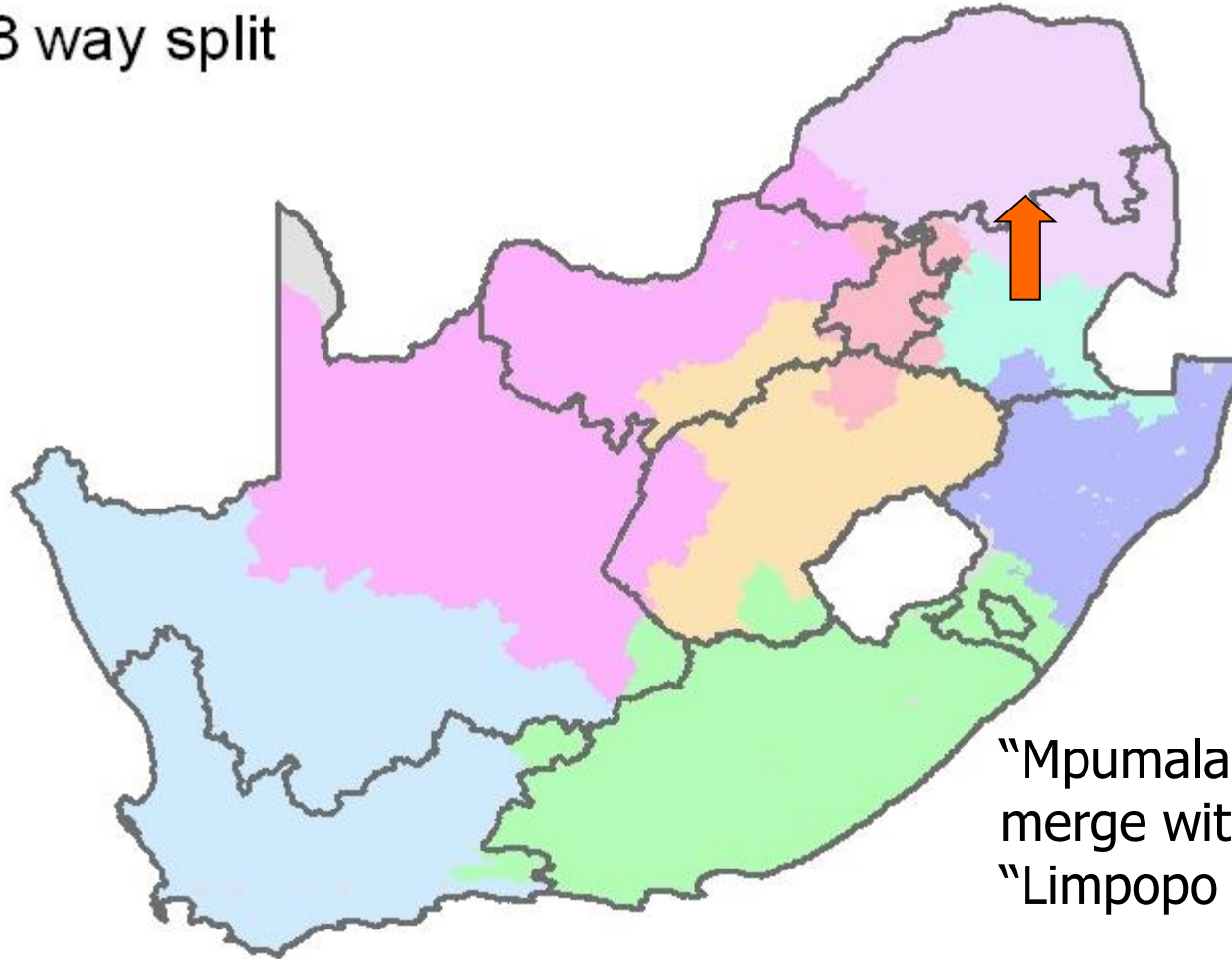


“Garden Route Province” will merge with “Western Cape Province”



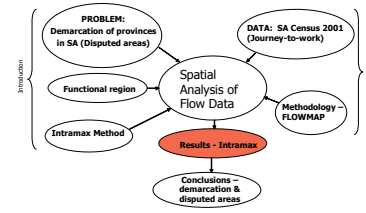


8 way split

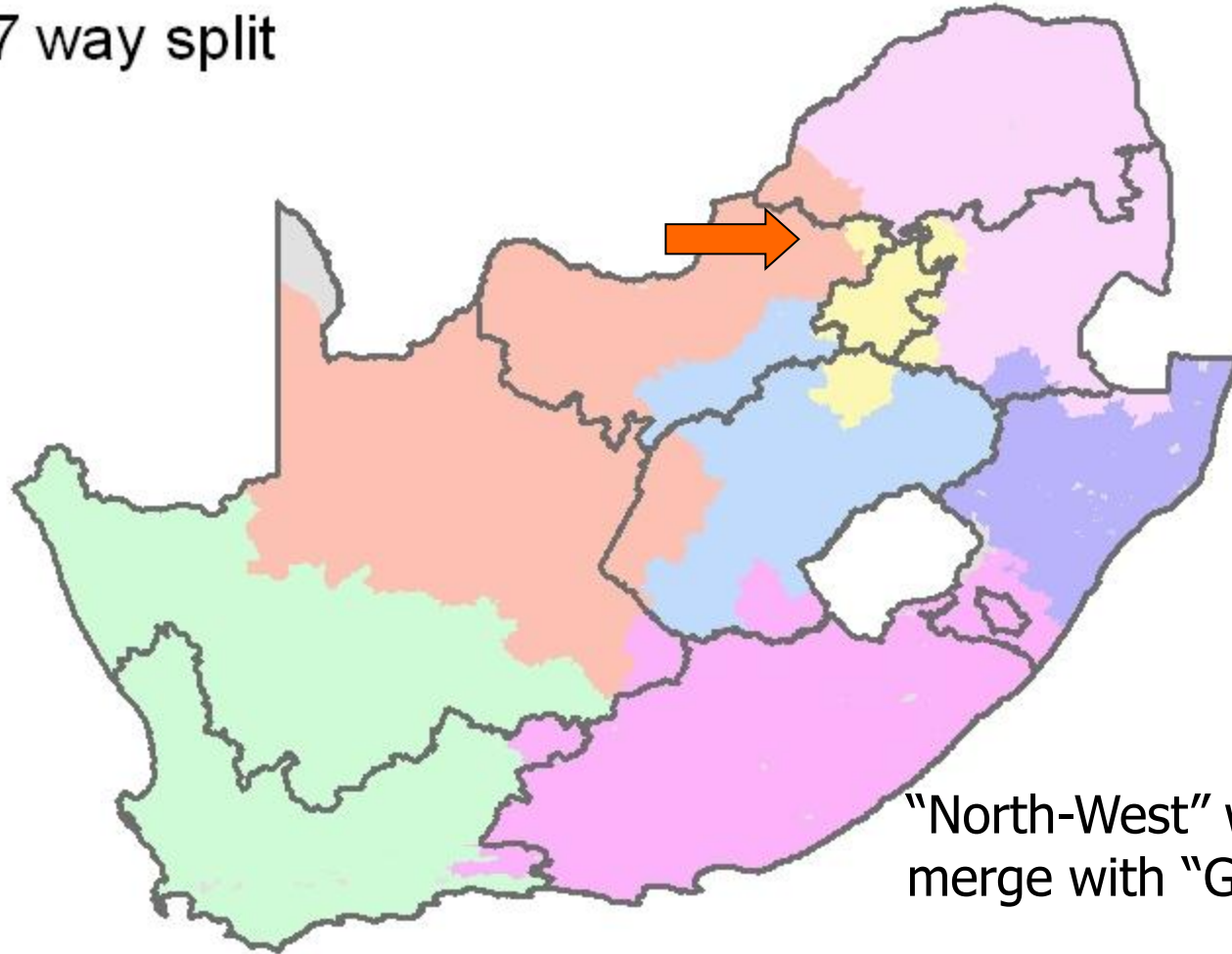


“Mpumalanga” will merge with “Limpopo Province”

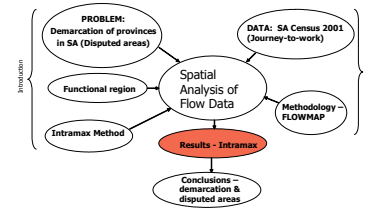




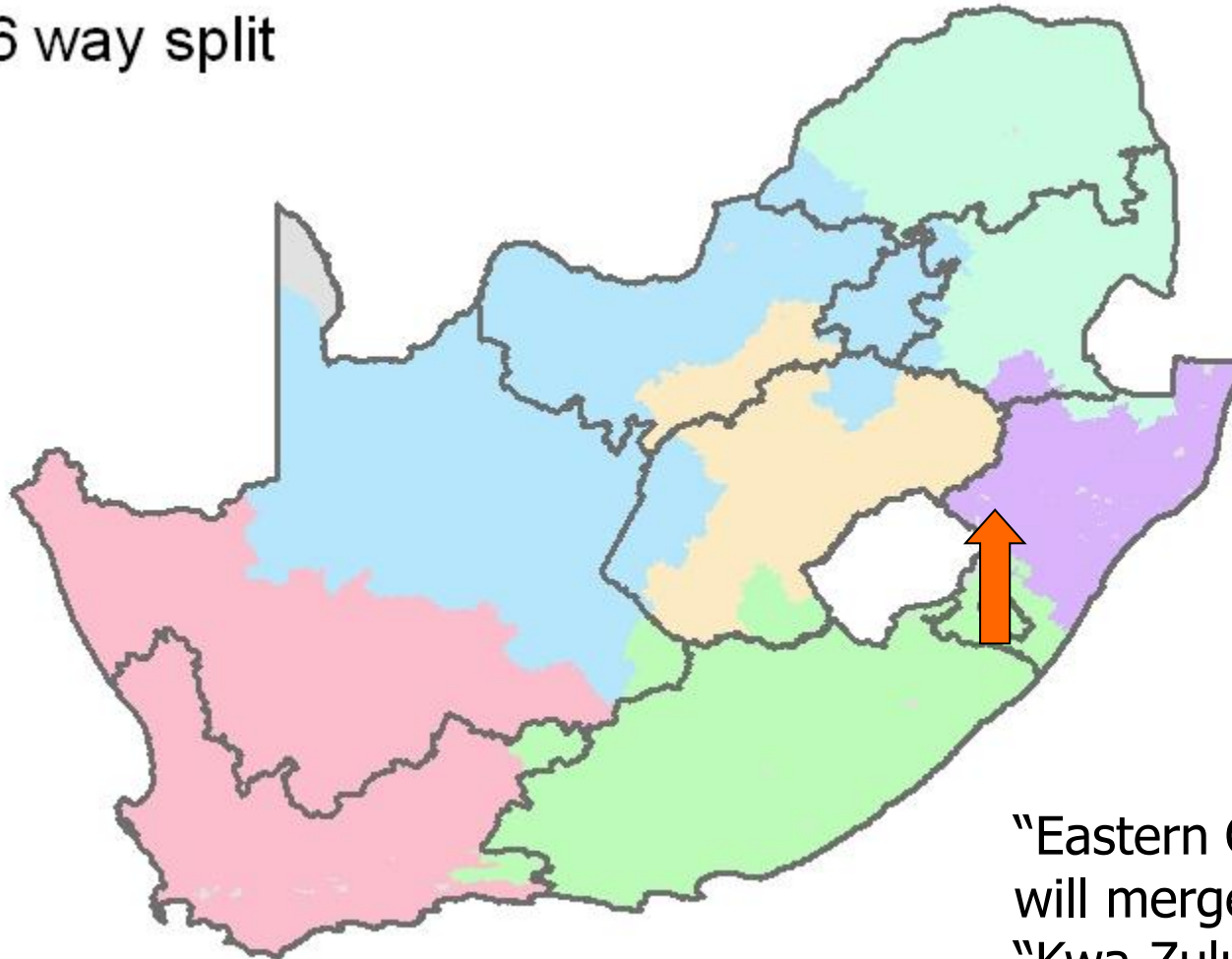
7 way split



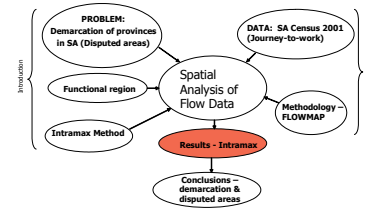
“North-West” will merge with “Gauteng”



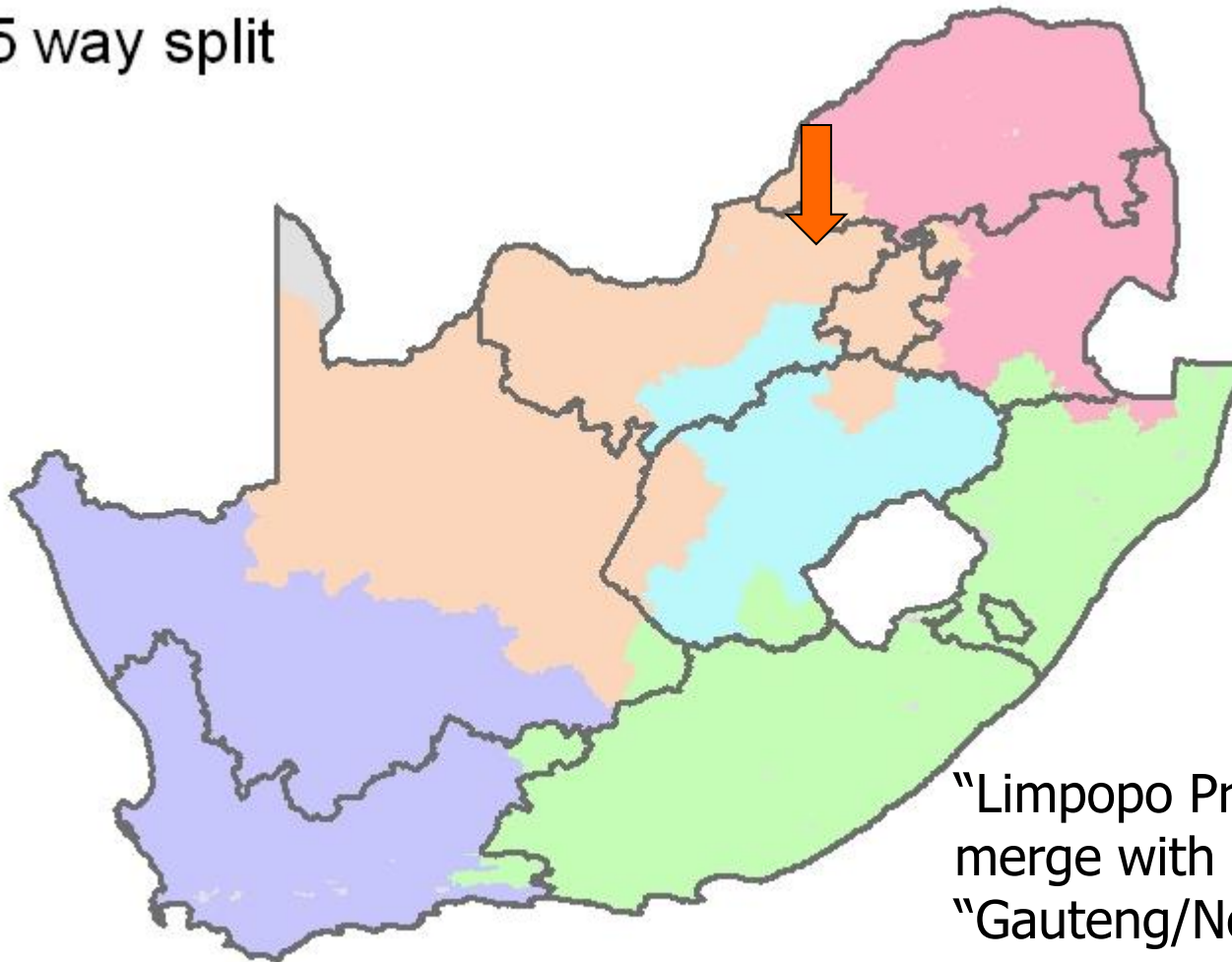
6 way split



“Eastern Cape”
will merge with
“Kwa-Zulu Natal”

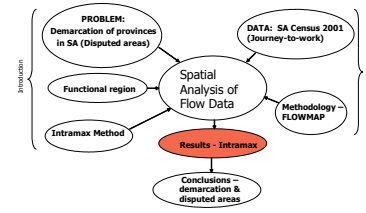


5 way split

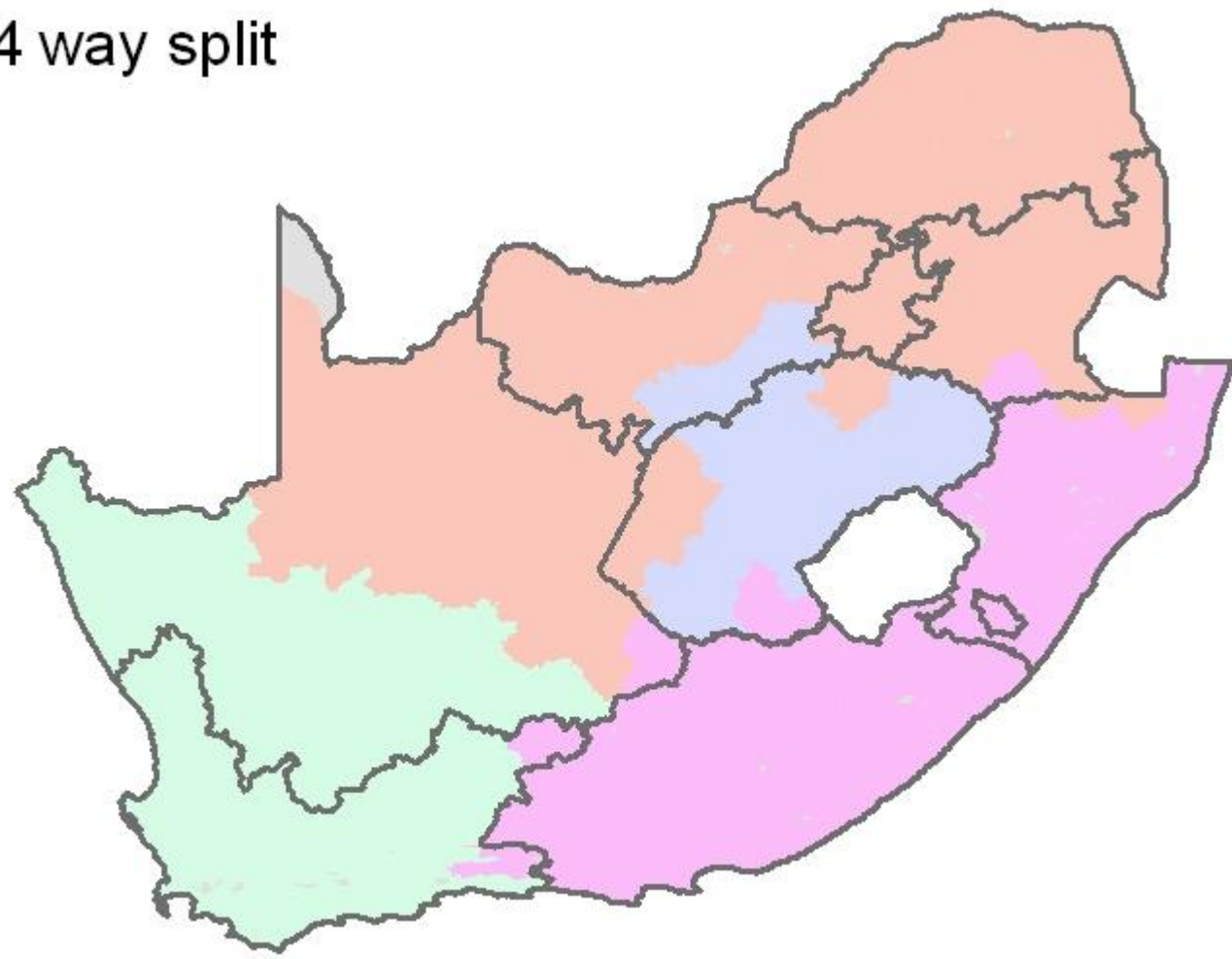


“Limpopo Province” will merge with “Gauteng/North-West”

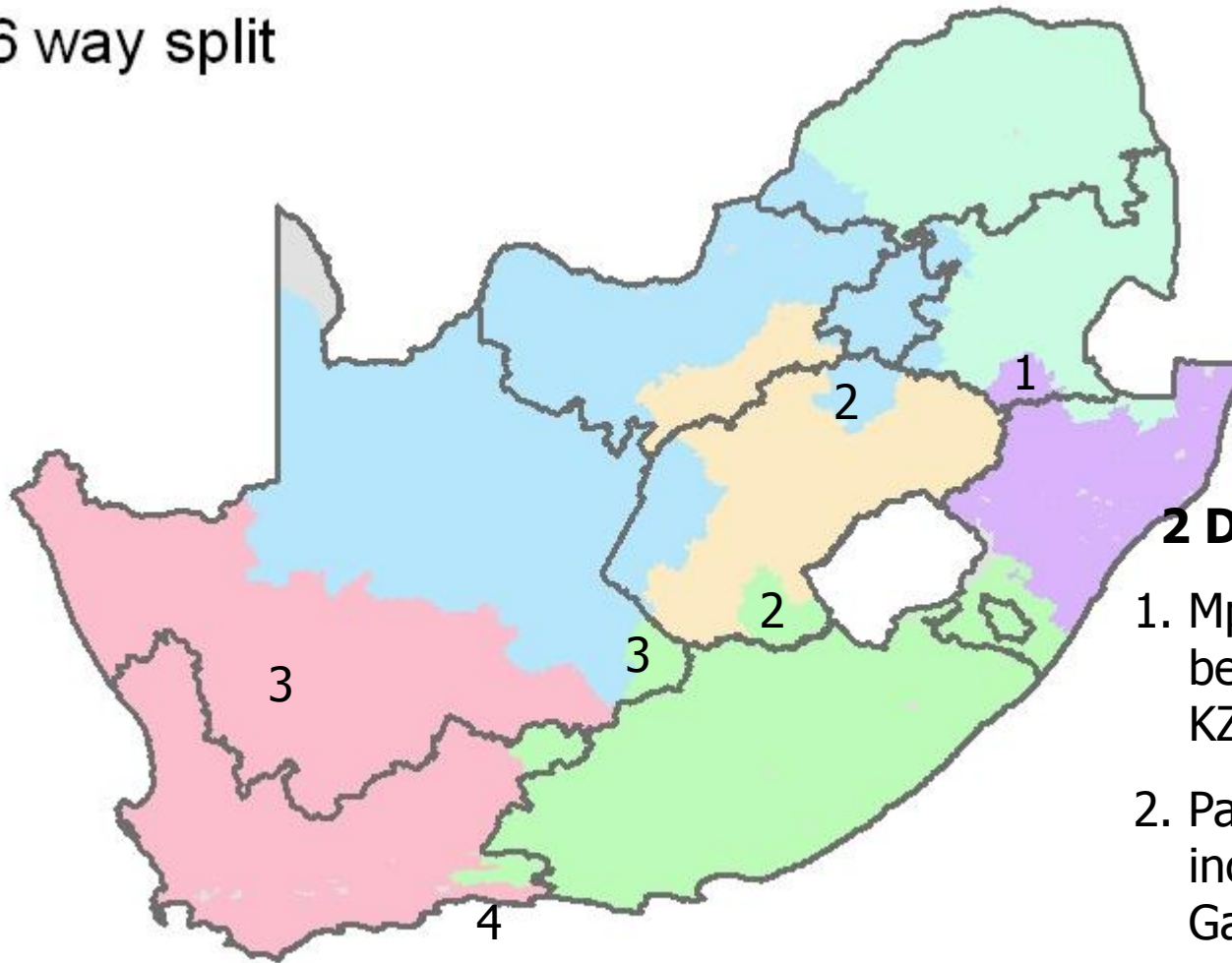




4 way split

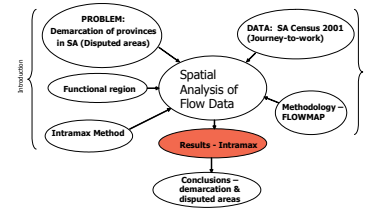


6 way split

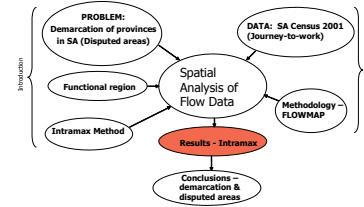


2 December 2010:

1. Mpumalanga divides between Limpopo & KZN
2. Parts of FS incorporated in Gauteng & EC
3. Parts of NC incorporated in EC and WC
4. Garden Route?



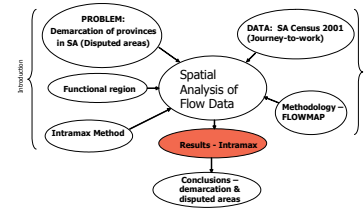
Comparing the five regions with regards to industry, employment and education



| | Intramax 5 Provinces Weighted mean per 1 000 persons (aged 15-65) Weighted median per 1 000 persons (aged 15-65) Weighted inter quartile range per 1 000 persons (aged 15-65) | | | | |
|--|--|-----------------------|------------------------|---------------------------|---------------------------|
| Province (number of main places) | Industry agriculture | Industry mining | Industry manufacturing | Employed | Grade 7 and less |
| Western Cape region (348) | 67 [A] 9 7 – 30 | 3.4 [C] 1.0 0-2 | 67 [A] 75 34-91 | 484 [A] 489 425-526 | 272 [C] 254 178-312 |
| Free Sate/ North West region (267) | 55 [A] 8 5-18 | 34 [A] 2 1-18 | 24 [D] 21 10-30 | 337 [C] 290 226-483 | 420 [A] 428 360-502 |
| Eastern Cape / KwaZulu-Natal region (1287) | 23 [B] 4 3-9 | 1 [C] 1 0-2 | 38 [C] 27 4-60 | 251 [D] 228 93-378 | 418 [A] 424 269-570 |
| Gauteng / North West region (627) | 22 [B] 6 4-10 | 23 [AB] 3 2-7 | 51 [B] 50 30-66 | 404 [B] 352 287-541 | 303 [B] 283 169-403 |
| Limpopo region (496) | 51 [A] 11 6-21 | 15 [B] 2 1-9 | 24 [D] 14 6-31 | 270 [D] 214 123-354 | 445 [A] 462 394-521 |
| South Africa (3025) | 34 7 4-13 | 13 2 1-4 | 43 38 11-63 | 337 322 189-497 | 367 360 228-500 |

[A] to [D]: different symbols indicate which means of these variables (comparing different regions) are significantly different, Bonferroni multiple comparison test, $p < 0.05$.

Comparing the five regions with regards to household income, type of housing and services



| | INTRAMAX 5 Provinces Weighted mean per 1000 households Weighted median per 1000 households Weighted inter quartile range per 1000 households | | | | |
|--|---|---------------------------|--------------------------|---------------------------|---------------------------|
| Province (number of main places) | Ann hh income | Brick house | Informal house | Electricity | Piped water in house |
| Western Cape region (344) | 75 615 [A] 63 850 36 408- 116 271 | 631 [A] 606 558-773 | 156 [B] 53 37-217 | 878 [A] 929 814-984 | 851 [A] 931 802-948 |
| Free State / North West region (266) | 30 853 [C] 18 610 13 926- 28 160 | 572 [B] 594 465-669 | 232 [A] 231 43-356 | 747 [B] 748 638-879 | 699 [C] 663 585-914 |
| Eastern Cape / KwaZulu-Natal region (1282) | 34 123 [C] 19 896 13 955- 36 424 | 413 [C] 429 204-568 | 106 [C] 41 13-131 | 573 [D] 645 299-859 | 458 [D] 516 46-820 |
| Gauteng / North West region (626) | 60 780 [B] 29 916 20 738- 101 675 | 555 [B] 558 437-676 | 211 [A] 147 51-327 | 787 [B] 853 698-916 | 754 [B] 856 684-911 |
| Limpopo region (491) | 26 135 [C] 17 642 13 787- 22 741 | 624 [A] 673 479-777 | 89 [C] 42 17-89 | 629 [C] 649 510-773 | 467 [D] 415 249-689 |
| South Africa (3009) | 46 361 23 954 16 190 – 56 298 | 530 558 411-682 | 155 82 23-243 | 702 763 581-903 | 623 731 384-886 |

[A] to [D]: different symbols indicate which means of these variables (comparing different regions) are significantly different, Bonferroni multiple comparison test, $p < 0.05$.

Final remarks

Intramax is robust – delivers results.

It is amazing what one can do with a single question in census data.

It may be worth-while to consider these results when new provincial boundaries are discussed.



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