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**Australian Government**
**Australian Bureau of Agricultural and Resource Economics and Sciences**

Committee Secretary
House of Representatives Standing Committee on
Regional Australia
PO Box 3021
Parliament House
CANBERRA ACT 2600

Dear Secretary

In December 2010 the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) made a submission to the House of Representatives Standing Committee inquiry into the impact of the Murray–Darling Basin Plan in Regional Australia. On 23 March 2011 officers from ABARES and the Agricultural Productivity Division appeared before the Committee. At that time the Committee requested that ABARES provide a summary of previously published information on the locations most likely to be affected by the implementation of the Plan to assist them in preparing their report. A copy of the submission is enclosed.

If you have any questions regarding this supplementary information please contact Peter Gooday

Yours sincerely,

Paul Morris
Deputy Executive Director

6 April 2011

Encl:

Australian Government
Australian Bureau of Agricultural and Resource Economics and Sciences

# Inquiry into the impact of the Murray–Darling Basin Plan in Regional Australia

## *Local level impacts of the Basin Plan*

### ABARES submission of supplementary information to the House Standing Committee on Regional Australia

### April 2011

www.abares.gov.au

## Introduction

In December 2010 the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) made a submission to the House of Representatives Standing Committee inquiry into the impact of the Murray–Darling Basin Plan in Regional Australia. Subsequent to this ABARES appeared before the inquiry. ABARES initial submission to the inquiry provided an overview of the potential impacts of the Basin Plan on irrigated agriculture and the broader economy, as well as the mitigating effects of government investment in improved irrigation infrastructure and government water purchases. While the report did provide some detail on the local level effects of changes in water policies, the Committee has requested additional information on these effects. This report provides additional information on the methodologies ABARES used to assess the local effects of the Basin Plan, and the results of this research.

## Scale is important

Scale is an important factor when analysing regional effects. This is especially the case for the Murray–Darling Basin Plan, which is likely to have a modest effect on economic activity at a basin or broad regional level (see ABARE–BRS 2010a), but more significant effects at a local level. For example, small towns surrounded by irrigated agriculture are likely to be more exposed to reduced economic activity due the Basin Plan than are larger regional centres that have a broader economic base.

ABARES used two different methodologies to identify towns and local communities that may be at risk from a reduction in economic activity due to reduced access to irrigation water (ABARE–BRS 2010a, b). The first approach involved combining regional estimates of changes in irrigated activity (as measured by the gross value of irrigated agricultural production [GVIAP]) with data on irrigation land use and expenditure patterns. The second approach involved mapping the vulnerability of communities in the basin using social indicators populated by Australian Bureau of Statistics (ABS) census data and water use data.

## Town level irrigation expenditure

ABARES used GVIAP estimates generated by its Water Trade Model (WTM) to identify regions where GVIAP is expected to decline most in response to the sustainable diversion limits (SDLs) contained in the Guide to the proposed Basin Plan. Table 1 identifies the six most adversely affected regions in the basin (see map 1 for a map of the Sustainable Yield regions) under the 3500 GL SDL scenario.

**Table 1: Projected changes in GVIAP from the long-term historical average for the most affected regions in the Murray–Darling Basin**

| Region | Change in GVIAP ($m/y) | Change in GVIAP (%) |
|---|---|---|
| Murrumbidgee | –225 | –25.3 |
| Gwydir | –84 | –26.1 |
| Goulburn–Broken | –83 | –11.8 |
| Murray (NSW) | –79 | –19.3 |
| Condamine | –70 | –15.3 |
| Murray (Vic) | –66 | –8.5 |

A reduction in irrigated activity is likely to be reflected in a shift away from irrigated agriculture to dryland agriculture. Since irrigated agriculture is more input-intensive than dryland agriculture, a shift toward dryland agriculture is likely to be reflected in lower farm input expenditure within a region.

The second stage of the analysis involved using ABARES irrigation farm survey data on the amount and location of irrigation farm expenditure to identify towns that are highly reliant on this expenditure.

The initial finding was that irrigation expenditure per town resident was higher in smaller towns than in larger towns (on average nearly $5000 per resident for towns with less than 1000 residents and less than $1000 per resident for towns with more than 10 000 residents), implying that smaller towns are at greater risk from a reduction in irrigated activity than are larger towns.

ABARES then identified specific towns that may be at risk from a reduction in irrigated agriculture based on the assumption that irrigation expenditure of $2000 or more per resident constituted a highly reliant town (see map 2). These towns tend to be concentrated in the southern Basin, especially above the confluence of the Murray and the Darling Rivers. When estimates of reliance are combined with GVIAP estimates associated with SDLs outlined in the Guide to the proposed Basin Plan, it would appear that many highly reliant towns are also located in regions where GVIAP is estimated to decline significantly. For instance, 16 highly reliant towns are located in the Murrumbidgee region, four are in the Murray NSW region and eight are in the Goulburn–Broken region.

**Map 1: Irrigation survey reporting regions**


*Note*: The hatched areas are regions not covered in the survey
*Source*: Ashton et al. 2009

A list of potentially highly vulnerable towns is presented in table 2. The list should be viewed as indicative only as it was constructed using survey data from only one year (2007–08) and the survey did not cover some regions (Gwydir, Moonie, Warrego, Paroo, Barwon–Darling, Wimmera, Campaspe and Ovens).

**Map 2: Highly reliant towns in the Murray–Darling Basin**

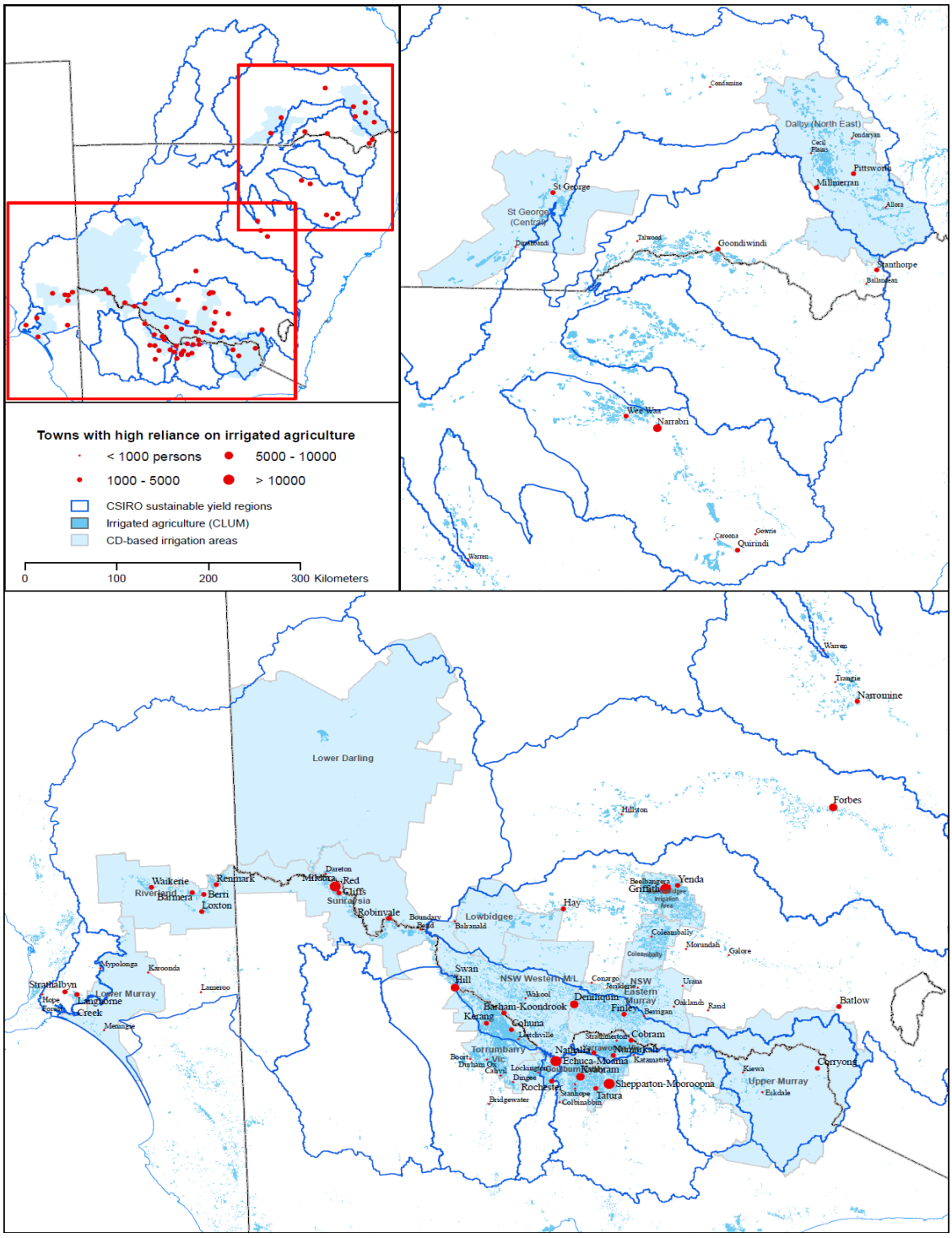


**Table 2: Towns highly reliant on expenditure from irrigation farms, 2007–08**

| Region | Town | Change in GVIAP | Population | Expenditure per resident | Total expenditure | Region | Town | Change in GVIAP | Population | Expenditure per resident | Total expenditure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | No. | $ | $ | | | % | No. | $ | $ |
| Condamine | Cecil Plains | –15.3 | 233 | 30 635 | 7 137 839 | Goulburn–Broken | Shepparton–Mooroopna | –11.8 | 31 811 | 5 126 | 163 050 780 |
| Condamine | Allora | –15.3 | 920 | 11 955 | 10 998 306 | Goulburn–Broken | Tatura | –11.8 | 3 308 | 3 634 | 12 020 776 |
| Condamine | Pittsworth | –15.3 | 2 568 | 8 053 | 20 679 976 | Goulburn–Broken | Nagambie | –11.8 | 1 382 | 2 218 | 3 065 856 |
| Condamine | St George | –15.3 | 2 410 | 5 289 | 12 746 394 | Campaspe | Rochester | –11.6 | 2 825 | 9 823 | 27 749 975 |
| Condamine | Millmerran | –15.3 | 1 225 | 5 103 | 6 250 734 | Campaspe | Echuca–Moama | –11.6 | 12 681 | 2 755 | 34 930 956 |
| Condamine | Condamine | –15.3 | 373 | 3 775 | 1 408 138 | Loddon | Lockington | –20.3 | 418 | 38 608 | 16 138 186 |
| Condamine | Dirranbandi | –15.3 | 439 | 3 722 | 1 634 041 | Loddon | Durham Ox | –20.3 | 25 | 31 373 | 784 328 |
| Condamine | Jondaryan | –15.3 | 515 | 2 946 | 1 517 339 | Loddon | Boort | –20.3 | 773 | 14 249 | 11 014 794 |
| Condamine | Gowrie | –15.3 | 252 | 2 786 | 702 085 | Loddon | Bridgewater | –20.3 | 305 | 9 109 | 2 778 306 |
| Border Rivers (Qld) | Talwood | –8.6 | 91 | 27 911 | 2 539 940 | Loddon | Calivil | –20.3 | 226 | 5 966 | 1 348 379 |
| Border Rivers (Qld) | Stanthorpe | –8.6 | 4 262 | 7 128 | 30 379 621 | Loddon | Pyramid Hill | –20.3 | 466 | 2 176 | 1 014 170 |
| Border Rivers (Qld) | Ballandean | –8.6 | 133 | 6 945 | 923 697 | Loddon | Dingee | –20.3 | 322 | 2 056 | 662 125 |
| Border Rivers (Qld) | Goondiwindi | –8.6 | 3 568 | 3 566 | 12 724 451 | Murray (NSW) | Wakool | –19.3 | 209 | 15 263 | 3 189 927 |
| Border Rivers (NSW) | Mungindi | –13.1 | 646 | 2 457 | 1 587 144 | Murray (NSW) | Finley | –19.3 | 2 057 | 6 997 | 14 392 726 |
| Namoi | Quirindi | –17.7 | 2 604 | 19 329 | 50 332 169 | Murray (NSW) | Deniliquin | –19.3 | 7 433 | 3 378 | 25 112 019 |
| Namoi | Wee Waa | –17.7 | 1 687 | 7 734 | 13 046 971 | Murray (NSW) | Barham–Koondrook | –19.3 | 1 935 | 2 426 | 4 694 600 |
| Namoi | Caroona | –17.7 | 179 | 7 194 | 1 287 653 | Murray (Vic) | Cobram | –8.5 | 4 108 | 12 581 | 51 682 050 |
| Namoi | Narrabri | –17.7 | 6 115 | 6 464 | 39 524 486 | Murray (Vic) | Cohuna | –8.5 | 1 889 | 10 306 | 19 468 468 |
| Macquarie | Trangie | –17.8 | 869 | 11 826 | 10 276 785 | Murray (Vic) | Numurkah | –8.5 | 3 677 | 6 494 | 23 878 769 |
| Macquarie | Warren | –17.8 | 877 | 10 356 | 9 082 580 | Murray (Vic) | Corryong | –8.5 | 1 229 | 5 917 | 7 271 514 |
| Macquarie | Narromine | –17.8 | 3 599 | 4 030 | 14 504 654 | Murray (Vic) | Kiewa | –8.5 | 265 | 5 907 | 1 565 244 |
| Lachlan | Hillston | –10.0 | 502 | 9 154 | 4 595 147 | Murray (Vic) | Swan Hill | –8.5 | 9 260 | 5 481 | 50 751 745 |
| Lachlan | Forbes | –10.0 | 6 952 | 2 415 | 16 787 412 | Murray (Vic) | Robinvale | –8.5 | 1 973 | 5 472 | 10 796 217 |
| Murrumbidgee | Conargo | –25.3 | 188 | 18 753 | 3 525 615 | Murray (Vic) | Eskdale | –8.5 | 436 | 5 443 | 2 372 930 |
| Murrumbidgee | Coleambally | –25.3 | 656 | 18 468 | 12 114 949 | Murray (Vic) | Kerang | –8.5 | 3 782 | 3 563 | 13 474 245 |
| Murrumbidgee | Oaklands | –25.3 | 238 | 9 122 | 2 171 015 | Murray (Vic) | Leitchville | –8.5 | 273 | 3 555 | 970 387 |
| Murrumbidgee | Balranald | –25.3 | 386 | 8 346 | 3 221 598 | Murray (Vic) | Nathalia | –8.5 | 1 431 | 3 515 | 5 029 464 |
| Murrumbidgee | Batlow | –25.3 | 1 001 | 6 751 | 6 757 951 | Murray (Vic) | Boundary Bend | –8.5 | 182 | 2 613 | 475 482 |
| Murrumbidgee | Griffith | –25.3 | 16 180 | 4 565 | 73 864 936 | Murray (Vic) | Mildura | –8.5 | 24 015 | 2 543 | 61 073 507 |
| Murrumbidgee | Beelbangera | –25.3 | 307 | 4 475 | 1 373 850 | Murray (Vic) | Red Cliffs | –8.5 | 2 738 | 2 468 | 6 756 782 |
| Murrumbidgee | Yenda | –25.3 | 1 065 | 4 343 | 4 624 794 | Murray (Vic) | Strathmerton | –8.5 | 467 | 2 214 | 1 034 041 |
| Murrumbidgee | Berrigan | –25.3 | 895 | 3 540 | 3 167 897 | Lower Murray–Darling | Dareton | –6.6 | 567 | 5 281 | 2 994 248 |
| Murrumbidgee | Galore | –25.3 | 224 | 3 370 | 754 916 | SA Murray | Lameroo | –5.8 | 518 | 13 438 | 6 960 848 |
| Murrumbidgee | Rand | –25.3 | 210 | 3 276 | 687 857 | SA Murray | Meningie | –5.8 | 939 | 13 233 | 12 425 440 |
| Murrumbidgee | Hay | –25.3 | 2 627 | 2 909 | 7 642 442 | SA Murray | Waikerie | –5.8 | 1 744 | 7 129 | 12 433 028 |
| Murrumbidgee | Urana | –25.3 | 335 | 2 742 | 918 580 | SA Murray | Loxton | –5.8 | 3 433 | 4 846 | 16 635 769 |
| Murrumbidgee | Morundah | –25.3 | 76 | 2 630 | 199 844 | SA Murray | Barmera | –5.8 | 1 926 | 4 294 | 8 269 551 |
| Murrumbidgee | Jerilderie | –25.3 | 775 | 2 017 | 1 563 222 | SA Murray | Renmark | –5.8 | 4 333 | 4 142 | 17 949 063 |
| Murrumbidgee | Leeton | –25.3 | 6 840 | 1 965 | 13 440 532 | SA Murray | Berri | –5.8 | 4 018 | 3 755 | 15 088 635 |
| Goulburn–Broken | Katamatite | –11.8 | 212 | 42 835 | 9 080 933 | SA Murray | Langhorne Creek | –5.8 | 1 198 | 2 340 | 2 803 548 |
| Goulburn–Broken | Colbinabbin | –11.8 | 112 | 38 812 | 4 346 963 | SA Murray | Karoonda | –5.8 | 356 | 2 092 | 744 684 |
| Goulburn–Broken | Stanhope | –11.8 | 522 | 18 136 | 9 467 185 | Eastern Mt Lofty Ranges | Strathalbyn | –0.5 | 3 894 | 5 289 | 20 595 678 |
| Goulburn–Broken | Kyabram | –11.8 | 5 980 | 7 919 | 47 355 799 | Eastern Mt Lofty Ranges | Mypolonga | –0.5 | 303 | 2 557 | 774 732 |
| Goulburn–Broken | Girgarre | –11.8 | 185 | 6 241 | 1 154 674 | Eastern Mt Lofty Ranges | Hope Forest | –0.5 | 60 | 2 365 | 141 908 |

*Source*: ABS 2007 ABARE–BRS irrigation survey data 2007–08 and ABARE–BRS WTM estimates of the change in GVIAP based on Basin Plan (3500 GL) with interregional water trade scenario

To gain further insight into which towns may be most affected by changes in water availability under the new SDLs, WTM estimates of changes in GVIAP by irrigated activity for regions where irrigated activity is estimated to decline significantly were compared with agricultural land use data. WTM estimates suggest that irrigated annual cropping and activities involving irrigated pastures are likely to decline more significantly than horticulture production as a result of reduced diversions. This result is, however, conditional on the WTM assumptions, which exclude the possibility of threshold yield effects in perennial agriculture, and do not fully incorporate the effects of any changes in supply variability.

Map 3 contains a spatial representation of land use in the Murray and Murrumbidgee regions. It shows that towns in the upper Murray, including Deniliquin, Coleambally, Kerang and Numurkah may be particularly affected because they are not only located in regions where GVIAP is estimated to decline significantly, but are also surrounded by irrigated cropping and pastures.

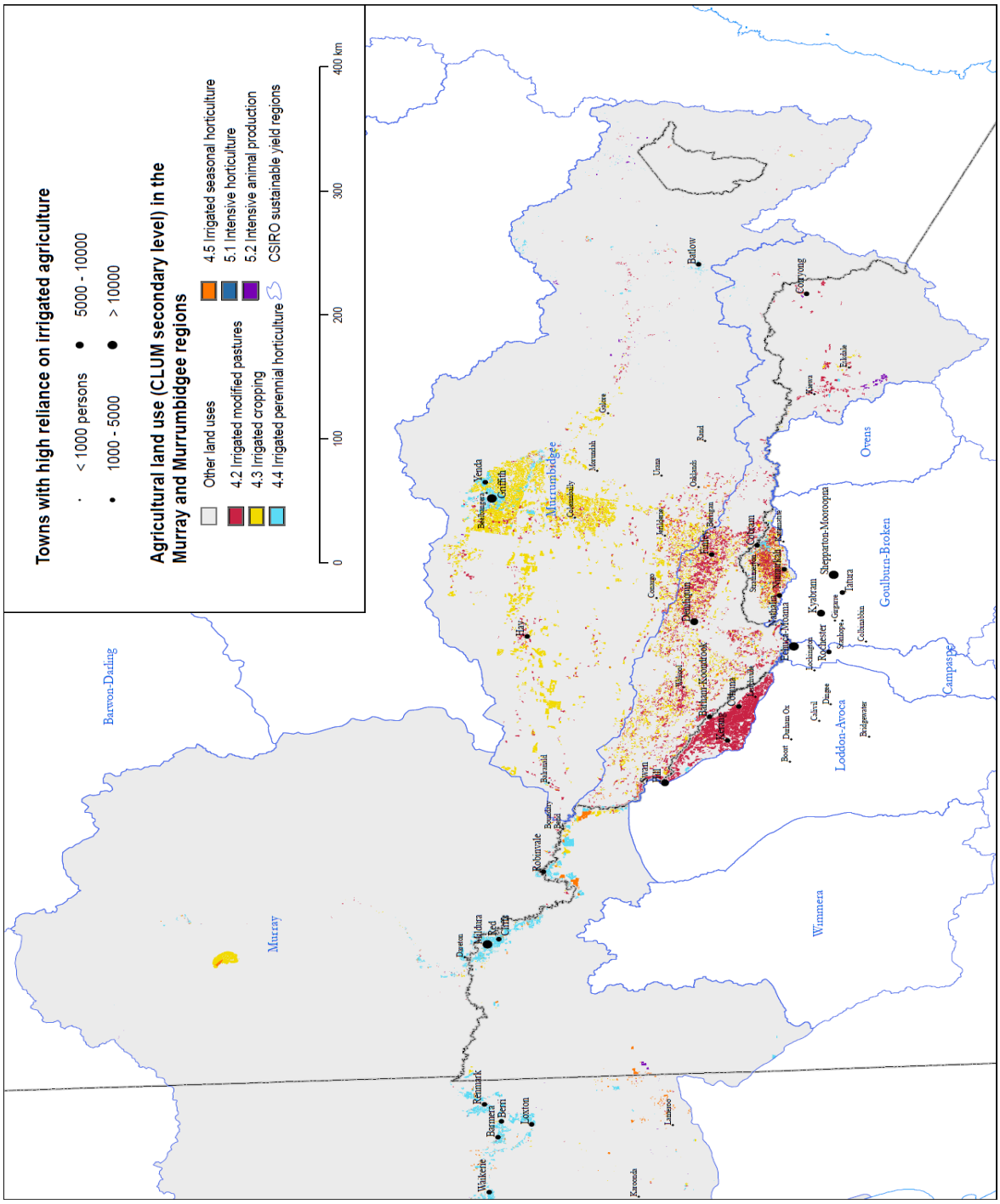
The analysis also suggests that towns surrounded by a more diversified crop mix, such as Griffith, are likely to be less affected than those surrounded by irrigated annual activities. Towns further down the Murray, around Mildura and Robinvale, are likely to be the least affected, as they are surrounded by horticulture, which is estimated to be least affected by reduced diversion limits.

Map 4 contains a spatial representation of land use in the Gwydir, Condamine and Namoi regions. A number of towns in these regions are located in close proximity to irrigated cropping (principally cotton) areas. Compared to the southern Basin there tends to be less diversity in irrigated activities in these regions so impacts can be expected to be spread more evenly across irrigation areas and associated towns. While the irrigation survey did not cover the Gwydir region, towns located near irrigated cropping areas in the Gwydir (Moree and Collarenebri) have been include in map 4.

While this analysis provides an indication of the towns in the Murray–Darling Basin that may be effected by the SDLs, in practice the future of individual basin communities will depend on a range of variables—many external to the Basin Plan—such as changes in commodity prices, the effects of other government policies, demographic changes and prevailing local climate conditions.

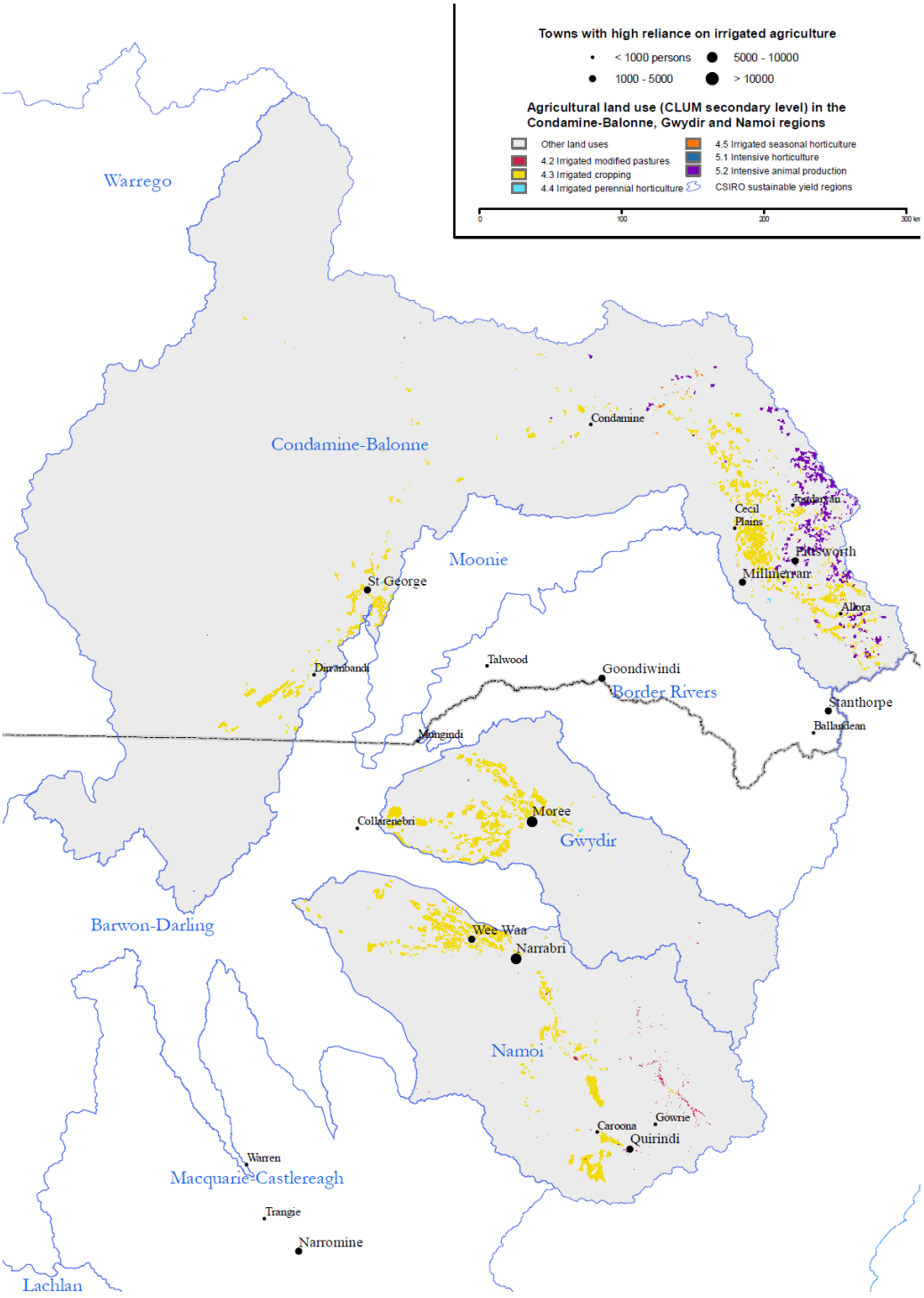
The modelling also has a number of limitations. First, the WTM results do not factor in the potential for future technologies to increase productivity and lower the cost of reducing irrigators' access to water. Second, the WTM results are based on long-run average diversions, and do not take into account the potential for a change in the variability of diversions to affect the pattern of irrigated activities. An increase in the variability of irrigation water supplies could make it more risky to invest in perennial horticulture, favouring an expansion in more opportunistic irrigated annual activities. Third, the method used to implement the SDLs could increase the variability of irrigation water supplies. At this point there is no information on how the states will introduce the SDLs. Fourth, when the Basin Plan is considered in the context of other water policies, such as the buyback, the pattern of purchases could also influence the variability in irrigation water supplies. For example, purchasing a high proportion of high security entitlements could increase the variability in irrigation water supplies, increasing the risk irrigators engaged in perennial horticulture face.

**Map 3: Land use in the Murray and Murrumbidgee regions**




It is also important to note the risks in trying to identify impacts at too fine a scale. The actual pattern of reduced irrigated activity will be largely determined by which irrigators decide to sell their entitlements to the government. ABARES irrigation survey data clearly identifies a wide variation in farm performance across industries and regions, as well as between irrigators within a region. As a result, it is difficult to identify parts of a region as performing relatively poorly and being more likely to participate in water purchase programs. And even if irrigators sell water to the government now, some of these irrigators could purchase water in the market at some point in the future if that becomes profitable. It is important that this is understood when attempting to estimate (or interpret) effects at a local level.

**Map 4: Land use in the Condamine, Gwydir and Namoi regions**




## Community vulnerability

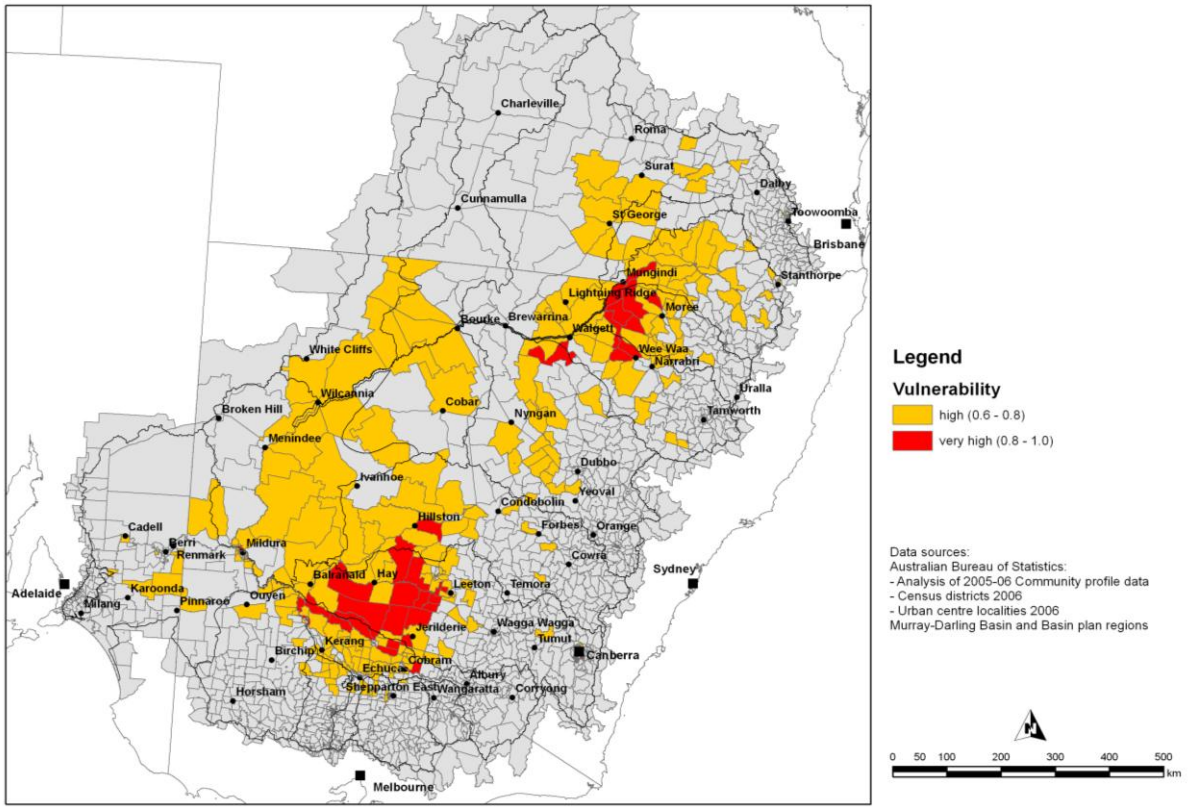
ABARES mapped community vulnerability in the Murray–Darling Basin using social indicators populated with ABS census data and water use data (ABARE–BRS 2010b).

The research defined community vulnerability as the degree to which a community is susceptible to pressures and disturbances (such as climate change), with vulnerability being a function of sensitivity and adaptive capacity. Sensitivity is defined as a measure of a

community's reliance on irrigation water and dependence on associated agricultural and processing employment. Adaptive capacity is defined as the inherent capacity of a community to manage or cope with change, taking into account measures such as income, education levels, age structure, mobility, housing and economic diversity.

The results of the analysis show that community vulnerability to changes in water availability varies widely across the Murray–Darling Basin (map 5). In particular, there are two large areas where community vulnerability is identified as being high to very high. One is located in the north-east of the Murray–Darling Basin (covering parts of the Border Rivers, Barwon–Darling, Gwydir and Namoi regions), and the other is concentrated along the Murray River above the confluence of the Murray and Darling rivers and along the Murrumbidgee River. The vulnerability study identifies communities located in these areas as having a combination of higher sensitivity to changes in water availability (that is, very high dependence on water for agriculture and high agri-industry employment) and limited capacity to adapt (that is, lower levels of human capital, social capital and economic diversity) compared with other areas in the Murray–Darling Basin. These areas roughly coincide with those identified as likely to face the most significant reductions in irrigated activity following the implementation of the SDLs.

**Map 5: Community vulnerability**




The method used in the analysis has several limitations. The first is that community vulnerability is complex, and it is unlikely that a single measure will capture the full experience of communities undergoing rapid change. Second, the use of ABS census data reveals only part of the story. Further validation and scrutiny of the indicators is recommended to establish whether they represent people's experiences at a community level, and to increase understanding of the community vulnerability index. As a result, map 5 is illustrative rather than definitive; it is intended to assist with understanding patterns of vulnerability in the Murray–Darling Basin.

## References

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