



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

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Photograph 10. Kandos limestone quarry, Kandos. Limestone from the Kandos quarry is used in cement manufacture on-site. The ideal grade of limestone for cement manufacture is around 70–80% calcium carbonate. The Kandos plant operates two kilns, producing about 450 000 tonnes of cement each year, which is sold entirely into the New South Wales market. (Photographer D. Barnes)

Potential and Outlook

New South Wales has abundant resources of limestone (Figure 14). Many of the deposits are of immense size, and some are potentially of sufficient purity to be used in high-purity applications. The only constraints to the development of these resources are the distance of most of the deposits from the coast, and the relatively small size and highly competitive nature of domestic markets. However, new market opportunities for New South Wales limestone and limestone products may exist in South East Asia.

There are more than 400 separate known deposits of limestone in New South Wales (e.g. Ray et al 2003; Photograph 10; Photograph 11). Very large, undeveloped, high-quality deposits of limestone occur in the central-western and southern parts of the Lachlan Orogen, in the Molong, Bathurst, Canowindra and Cooma areas. There are also large deposits at several sites in the New England region.

Many of the largest deposits are near rail lines, and occur in settings which have been heavily modified for agricultural use, and are thus amenable to quarrying.

Areas with the greatest potential for high-purity limestone are the following:

- Molong to Canowindra
- south of Yass
- northeast of Cooma
- near Bathurst
- north of Tamworth
- around Ashford in the far north of the state.

Most limestones in those areas are biohermal or biostromal in nature, and formed on steep continental margins or steep-sided volcanic arcs. In contrast to the extensive shelf deposits in other parts of the state, they tend to form long, comparatively narrow bodies with abrupt margins.

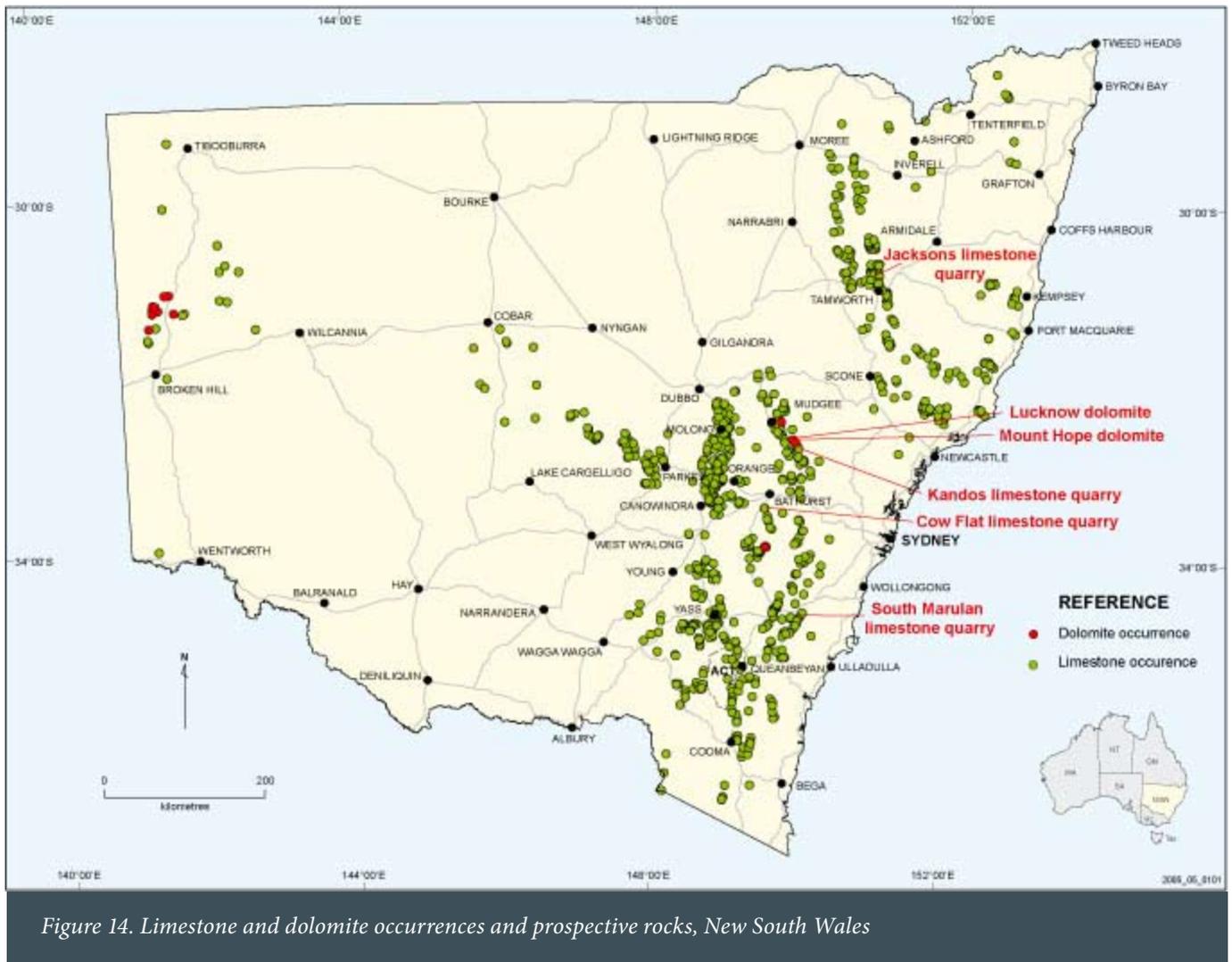


Figure 14. Limestone and dolomite occurrences and prospective rocks, New South Wales

Nonetheless, there are many very large deposits in New South Wales with up to 99% CaCO_3 , combined iron oxide and alumina of less than 0.3%, less than 1% MgCO_3 , and less than 0.5% silica. The dimensions of many of these deposits are in the order of tens of kilometres long by several hundred metres wide.

There are good opportunities for increased limestone production for agricultural applications to combat soil acidity problems. Particular opportunities exist in areas well-removed from existing producers.

Nature and Occurrence

Limestone is a relatively common sedimentary rock formed from remains marine organisms such as coral or other invertebrates, and composed largely of calcium carbonate and other carbonates.

Limestone can be defined as having 90% or more of calcite (CaCO_3), the other 10% usually being a mixture of dolomite ($\text{CaCO}_3 \cdot \text{MgCO}_3$) and various impurities, the most common of which is silica. With increasing

amounts of dolomite, limestone grades into dolomitic limestone and calcareous dolomite, and with increasing impurities into calcareous sedimentary rocks, such as marl. Marble is limestone which has been recrystallised through metamorphism. In many applications, marble and limestone are interchangeable.

In many essentially chemical applications, such as the manufacture of cement and lime, limestone as defined above is used, while in applications such as fillers or whiteners where limestone is used for its physical characteristics, limestone or dolomitic limestone can be used. Limestone is also used as hard-rock aggregate: e.g. in the USA more than 40% of all limestone mined is used as aggregate. The specific use of limestone as an aggregate is not discussed here.

The large quantities of limestone consumed and the nature and number of industrial applications in which it is used make limestone one of the most important of all industrial minerals (e.g. Photograph 12). Because of its relatively common occurrence, however, limestone



Photograph 11. Limestone stockpile at the Omya Limited processing plant at Bathurst. Omya Southern Pty Ltd mines high-quality limestone at Cow Flat, near Bathurst. The company produces a range of ground calcium carbonate products at the on-site processing plant for use as filler materials and in chemicals. (Photographer D. Barnes)

and limestone-based products are commodities with only medium unit-value.

Limestone and other carbonate materials occur widely throughout the world, and there is little international trade except under special circumstances and except for the higher grade, higher unit-value limestone-based commodities, such as lime or cement clinker.

The most common source of calcium carbonate in the world is limestone itself, but in some places other calcareous sediments or other calcareous materials, such as coral, are used. For example, coral was dredged for many years from Moreton Bay near Brisbane for cement making.

New South Wales Occurrences

In Australia, limestone of various types is the main source of calcium carbonate, and in New South Wales all calcium carbonate produced comes from limestone. Because limestone-based commodities are in the

medium price range, most mines are situated relatively close to markets and, in the case of cement-making, usually close to the source of fuel (coal).

The Sydney region is underlain by the Sydney Basin sedimentary sequence, its surface largely devoid of significant limestone deposits. Therefore, the region depends on several large deposits in the Lachlan Orogen along the basin margins. Other markets, such as agri-culture, are supplied from a small number of regional producers.

Large-scale mining for cement and lime manufacture occurs at several sites throughout the state (South Marulan, Kandos, Cow Flat and Attunga, which is north of Tamworth).

Production of limestone in New South Wales averages about 4 Mt. Throughout the state, over 400 separate occurrences of limestone have been identified. Details of these occurrences were recorded by Carne and Jones (1919), Lishmund et al. (1986) and in the Geological Survey's New South Wales Industrial Minerals Database (Ray et al. 2003).



Photograph 12. Limestone is a major raw material used in cement in many construction applications. Apart from cement manufacture, other uses for limestone include manufacture of lime, coarse aggregate, metallurgical flux, filler materials, glassmaking, ceramics and chemicals. (Photographer D. Barnes)

At some stage in the future, populations in regional centres may increase to the point where regional cement plants become economic. Higher purity limestone is mined at several centres for other uses — such as fillers, glass, coating and whiting agents, and agricultural lime. Current production is aimed at the relatively small domestic market. Most plants need to produce both high and lower grade (e.g. ground limestone for agricultural use) products to survive.

There is an abundance of potentially suitable deposits within the state. The following is a selection of the most promising deposits.

- The Canomodine Limestone, which crops out over an area of up to 3.5 km wide by about 10 km long, in open country between Cargo and Canowindra in the central western part of the state. Several analyses (Carne & Jones 1919, reported in Lishmund
- et al. 1986), indicate iron oxide as low as 0.14%. ACI Minerals explored this deposit in the late 1990s. Drilling defined a resource of 250 000 t of high-quality limestone (ACI Industrial Minerals Division 1998). However, the resource was not developed
- The Molong and Reedy Creek Limestones, which crop out over large areas south of Molong, north of Orange. Most of the deposits are within 2 km of a rail line, and the country is amenable to quarrying. The Molong deposit is quarried on a small scale for aggregate and agricultural lime near Molong
- The Cliefden Caves Limestone Subgroup occurs further to the south, about 6 km west of the Bathurst–Cowra railway. In spite of the presence of caves in some areas, there are enormous reserves of potentially high-purity limestone in other parts of the deposits, in settings amenable to quarrying.

- The Bunyan limestone (Lishmund et al. 1986), which covers large areas northeast of Cooma in the southern highlands, not far from the Cooma to Canberra rail line. Several analyses indicate consistently high quality
- The Taemas and Cavan Limestones, which cover very large areas south of Yass, near the headwaters of Burrinjuck Dam on the Murrumbidgee River. The Taemas Limestone is silicified in part, but there are large areas of high-purity rock
- The Ashford Limestone is a very large deposit near Inverell in the state's far north. Although parts of the deposit are unavailable for mining because they are within caves reserves, significant resources are present in the southern end of the deposit. Several assays in various references indicate consistent high purity.

Applications

Global production data for limestone is not readily available, but is likely to be very large (less than 100 Mt yearly). Worldwide, limestone and other carbonate rocks are used mainly in cement-making (15% to 25% of consumption), and the manufacture of lime (CaO) (about 10%). Lime has myriad uses, including steelmaking, agriculture, chemical manufacture, water treatment, food processing, construction and agriculture. Much of the limestone mined elsewhere is used as aggregate, but this is uncommon in New South Wales.

In New South Wales, limestone is used in cement-making, in the manufacture of lime for steelmaking and various other applications in the agricultural, glassmaking and chemical industries, as high-purity high-whiteness fillers and coating agents, and in coal mine dusting for fire prevention. Cement and lime (for steelmaking) are by far the major consumers.

There are many other, lesser, uses of limestone and carbonate rocks, including: the manufacture of soda ash, removal of sulphur in coal combustion, water treatment, food processing and stockfeed additives.

Economic Factors

The state's cement industry is dominated by a small number of companies, all of which have operations elsewhere in Australia. Due to the large capital costs of establishment, the cement industry is focused on the major markets of Sydney, Newcastle and Wollongong. Regional centres are supplied by those plants or from interstate.

Various proposals have been considered from time to time for smaller independent cement plants, but these have always been found to be impracticable, usually because of insufficient local markets.

Significant amounts of cement clinker or cement have been imported at times, either as back-loading after steel exports or because of corporate links with production in other states. The existing industry has sufficient limestone resources for the foreseeable future.

Lime-making is less severely constrained by start-up costs, but there are still economies of scale which restrict the number of producers. A significant proportion of the lime production in the state is obtained from the Blue Circle Southern Cement Ltd South Marulan limestone deposit, which the company mines for cement-making.

Limestone used to make lime must not produce a large proportion of fines on calcining. In recent years lime has been produced by an independent producer (Hyrock Pty Ltd) using a recommissioned cement plant at Charbon near Kandos, and based on the Excelsior limestone deposit near Capertee.

Many parts of the state, particularly the Southwest Slopes and Plains region, have acid soils that would benefit from the application of lime. Demand for agricultural lime has grown in recent years and is creating opportunities for the development of new resources to meet regional demands.

Other markets for limestone-based products, such as fillers and glassmaking, are highly competitive. Domestic markets are relatively small, making entry difficult for new producers. New producers would probably need to develop overseas markets to succeed.

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