

Biomass as a Source of Renewable Energy in Spain: A Case Study in Regulating Renewable Energy

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Abstract This paper examines how, in Andalusia, the installation of plants producing biomass or processing electricity from renewable energies could conform to the public interest actions in Article 42 of the Andalusian Town Planning Act; and how the Andalusian Draft of Renewable Energies and Saving and Energy Efficiency proposes working out territorial plans for renewable energies for specific areas, where those zones enjoying the best conditions for the usage of these energies will be defined, specifying in each case the preferred renewable energy sources and their potential.

THE POTENTIAL OF BIOMASS AS A RENEWABLE ENERGY SOURCE

From mankind's beginning and well into the industrial revolution, biomass was the prime source of energy for cooking and keeping warm. The use of fossil fuels – principally oil, natural gas and coal – is still in a stage of expansion. In contrast, the need to avoid reliance on the producing countries and the rise in prices caused by the international situation have forced Europe to look again towards plants and trees as an everlasting source of clean energy output.¹ Scientists seem to agree that this is the source which enjoys the greatest potential for future increase and supply, rejecting nuclear fusion, whose technical control remains a mystery for the present.²

The European Union has defined biomass as 'the biodegradable part of the products, rubbish and waste coming from agriculture (vegetable and animal origin substances included), from forestry and from related industries, as well as the biodegradable fraction of industrial and town waste'.³

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- 2 The Renewable Energy Promotion Plan in Spain states that the energy coming from biomass is supposed to grow more than any other renewable energy in Spain, among such renewable energies it implies 63% of the whole. Moreover it is a resource with huge potential in our country. In order to foster it in the short term, the approval of a promotion programme of biomass is planned which will be in force at least three years. At worldwide level, three MEOT are consumed daily coming from biomass which implies 14% of the total consumption of energy. Notwithstanding, the greatest consumption takes place in underdeveloped countries, as in the developed ones. In 1995, it ranged between 1 and 3%. See Spanish Research Forest Centre of Lourizan, Management and Forest Exploitation of the Wood, 1995, p 76.
- 3 Directive 2003/30/CE of the European Parliament and the Council, 8 May 2003, concerning the promotion of biofuels and other renewable gas in transport.

Whereas wind and water power have electricity generation as their basic aim, the special feature that biomass presents allows it to be used not only to produce biogas (whose combustion alone or together with other gas energies can be equally used to produce electricity) but also and mainly to be used as biofuel for any kind of machine (cars, heaters, industrial machinery and so on). This second aim makes biomass the only renewable energy source capable of reducing the huge emissions of greenhouse effect gas from the transport sector whose demand for energy is currently 30 per cent of the whole burnt in the EU and which greatly contributes to the global production of these fumes in the European Union (60 per cent).⁴ In this way, biomass is the equivalent of solar energy, both of which are used to generate electricity and for heating and neither being fully developed as an energy source for vehicles.

The Spanish Renewable Energy Promotion Plan (henceforth REPP⁵), passed by agreement of the Board of Ministers on 30 December 1999 and worked out by the Diversification of Energy Institute (DEI) answered the demand established by the Electric Sector Act 54/1997 (henceforth ESA) states the majority of raw materials to produce primary biomass as follows:

- (a) Oily seeds (such as rape-seed, linseed, soya, etc.) whose vegetable oils can be turned into biodiesel to be used along with fossil fuel-sourced diesel gas in diesel oil vehicles, without having to change their engines. If the biodiesel were used in an unadulterated state, replacement engines would be required – making it an impossibly high medium-term cost. Vegetable oils can also be turned into ink for printers or lubricants for automobiles, with a better profit and useful life than the synthetic oils derived from crude oil.
- (b) Starch-rich plants (such as wheat, corn, beetroot, potatoes, manioca, barley, chicory, flax, etc) which produce bioethanol. When fermented they can be used as a complement to, or substitute for, petrol.
- (c) Lignocellulose plants (such as grass, fast growing trees, wood and wood waste) can also be used in order to produce bioethanol or synthetic biodiesel. Nevertheless, whatever their great potential, the technology required to process the cellulose, hemicelluloses and lignina (wood components) is still underdeveloped. By grinding these plants or the wood we obtain pellets or conglomerates of high calorific power to feed boilers with which heat and/or electricity can be jointly generated.

The development of this technique and the use, in general, of the best technologies available can imply a greater profit from energy cultures requiring the use of less land.⁶

4 To make matters worse, the forecasts are of a 40% rise in the emissions of the transport sector up to the year 2012. Cfr. Del Álamo Jiménez J.M., *Requerimientos...*, *op. cit.*, p 2. Unfortunately biogas price is still more expensive nowadays than the one of the fossil gas derived from oil. The oil barrel price is about €30 whereas the additional cost of a litre of biogas is €0.3. In the year 2000 biogas only supposed a 0.3% (around 700,000 tons) of the total diesel oil and petrol consumption in the European Union, and only six countries contribute to its production in this order: France, Germany, Spain, Italy, Sweden and Austria. Cfr. M. Ballesteros Perdices, *The contribution of biomass to the development of renewable energies. Developments in technology and industrial uses of liquid biogas*, (CIEMAT: Madrid, 2002) 3–5.

5 The global aim stating that by the year 2010 in Spain renewable energies will form 12% of the total offer of primary energy, implies a rise of 11.5 GW in the production power of electric energy, which means 61% of the installed power in 1998. So, this supposes that at the end of the Plan 17% of the total electricity will be generated from renewable energy (except large hydraulic power stations).

6 In general, the improvement of technology and demand of land behave as inversely proportional items. Energy Saving and Efficiency – Spanish Strategy, passed on 28 November 2002 by the Board of Ministers for

- d) Biodegradable home waste (such as frying pan oils) or organic waste, manure either domestic or from farm animals, sludge mud from sewage farms and so on, can be used to produce methane (or biogas), gas with attributes resembling natural gas of fossil origin that can be very useful as gas for transport (alone or turned into biodiesel, biohydrogen or biometanol) or to generate heat and/or electricity by means of its combustion.⁷ It would be very suitable if local authorities that grant the indirect management of the public service of cleansing and water supply, or waste processing, included in the technical description of same, the obligation to set up biogas production-attached plants based on the anaerobic digestion of its waste. In spite of this, the gradual reduction of organic material emptied out in rubbish dumps cuts down (and will do even more so in the future) the potential amount of biogas available.⁸

We must take into account that all these crops or plantations generate, after their first exploitation, waste that can be used again for the production of secondary biomass energy, although of less energetic power, since the straw derived from the seeds and cereals can be used to produce ethanol by means of fermenting;⁹ biodiesel extraction from oil also produces glycerine as waste which can be reused for other purposes; starchy plant dregs are also used to generate heat and electricity by means of combustion at the same time. This added asset makes biomass the energy source with the highest potential to increase – all over the world. In any case, the future of biofuels is more in their use as a mixture of diesel and gasoline than as a proper gas. Actually, European legislation allows up to a five per cent of ethanol in gasoline and, although it does not state anything about biodiesel, countries such as France mix it with diesel oil in a five per cent proportion.

The environmental advantages of biomass compared with fossil fuels are huge since its combustion in furnaces does not bring about ashes. Moreover, the use of biodiesel or bioethanol in engines reduces sulphur and chlorine emissions drastically, more even than the reduction in the amount of carbon monoxide and nitrogen oxides. On the other hand, since it is taken from plants, it is considered that the balance of CO₂ let out and consumed

the span of years from 2004 to 2011, states that in that period an energy saving of €12,853 m can be achieved equivalent to all the crude oil imported in a year by our country, an aim that can be reached, to a great extent, thanks to the use of the best technologies available as a measure to foster the saving carried out not just by the Administrations but by the productive sectors implied.

- 7 Furthermore, as there is an increase in the energy collection and exploitation of this kind of waste the land demands for other raw materials from which biomass is obtained will decrease, either energy or forestall cultures or land for processing plants and/or distribution of their products. In this sense, for example, we must understand point 4 of the Attached Document I to the Royal Decree 1481/2001, 27 December, which regulates the removal of waste through deposit in rubbish dumps when it forces all rubbish dumps to have attached plants of methane collection and exploitation: 'In all rubbish dumps receiving biodegradable waste the rubbish dump gas, will be treated and exploited. If the collected gas cannot be exploited to produce energy, it must be burnt'.
- 8 We must remember that the Directive 1999/31/CE of the Council, 26 April 1999 concerning the disposal of waste (State News Bulletin n° L 182 of 16 July 1999 pages 0001–0019) states that, at the latest, 15 years after the date to which point 1, Art. 18 refers, biodegradable town waste devoted to rubbish dumps must have reduced up to 35% of the total amount (in weight) of town biodegradable waste generated in 1995 or in the last year before 1995 in which there are standardised data from Eurostat.
- 9 Straw is not the same as fodder. As far as fodder is concerned (flour, dried alfalfa pellets, alfalfa, sainfoin, clover, lupins, vetches and others) there was the paradox that their use was carried out, in some countries, by means of a prior dehydration in which fossil gas was used. The OCM reform of dried up fodder has discouraged these practises, allowing the industry a period of transition until the 2007–2008 campaign, establishing only a decreasing subsidy and framed to that period that should be of €8.25/ton(COM (2003) 23 final).

by the same is zero.¹⁰ To sum up, the environmental imprint of biogas lowers itself naturally in any environment by 98 per cent after 21 days of their release, compared to 50 per cent with fossils fuels.

THE LAND REQUIRED TO DEVELOP BIOMASS AS A SOURCE OF RENEWABLE ENERGY

INTRODUCTION

All renewable energy sources require suitable facilities for implanting them. However, in the case of some of them such facilities do not suppose an important land demand and so, their development does not imply direct competition with other human uses of the same. So, for instance, hydraulic or mini-hydraulic plants settle over hydraulic public property, mainly over the same river bed; or the solar energy installations sited chiefly over buildings to produce thermo energy. By contrast, wind power and biomass require large quantities of surface for their instalment, surface that is scarce and which society has used traditionally for farming or housing. Assigning use of these types of land is the responsibility of the territorial Administrations (mainly those relating to autonomy, due to their responsibility in energy matters, town and country planning and urban development). However such a consideration has implications that go beyond its jurisdiction, due to the finite and limited character of the resource and the environmental demands coming from Spanish international engagements. Let us quote some of such engagements due to their significance:

1. Article 3 of the 2003/30/CE Directive, 8 May, of the Parliament and Council about the promotion of biogas uses or other renewable gas for transport, advises that two per cent of the total amount of gasoline and diesel oil consumed by road transport in the European Union be replaced by biofuels before 31 December 2005 and that such a percentage be 5.75 before 31 December 2010.¹¹ These are indicative objectives, since the strong opposition of some member countries of the European Union, avoided the adoption of compulsory targets. The Directive defines 'biofuel' as the liquid or gassy gas for transport produced from biomass. Scientists think that, whereas the two per cent objective is on the point of being fulfilled, the 5.75 per cent target for the year 2010 seems to be much more ambitious because it will need a huge amount of land.¹²

10 Cfr. Valbion (Valorisation de la Biomasse ASBL), *Les potentialités de la biomasse*, Dossier de presse de l'Association Wallone de la Biomasse, Belgique, p. 4. Apart from this environmental benefit, biomass exploitation is considered to generate more uses than the exploitation and processing of fossil gas, since it is mainly a native or local energy, difficult to transport, that equally requires local processing.

11 The Commission Proposal 'Sustainable Development in Europe for a better world: European Union Strategy for a sustainable development' (COM 2001/0264 final) also mentions as indicative objective for the year 2010 that the alternative gas consumption, even the biogas, stand for at least seven per cent of the car and truck consumption and 20% in 2010.

12 See M. Enguádanos, A. Soria, B.Y. Kavalov and P. Jensen (IPTS), *Techno-economic analysis of bio-diesel production in the EU: a short summary for decision-makers*, EUR 20279, 2.002. Eighty-five per cent of the area devoted to non-agricultural cultures but dedicated to biomass is of rape-seed that has a greater use than the sunflower. An hectare of rape-seed yearly produces 990 kilos of rape-seed oil or 1,090 litres of biodiesel. However, the warmer climatic conditions of the Mediterranean countries make the sunflower the suitable species to produce biodiesel in this area. A sunflower hectare yearly produces a crop of 600 kilos of oil or 700 litres of biodiesel.

2. By the year 2010, 12 per cent of the gross European energy consumption will have to be supplied by renewable energy sources.¹³ So it is stated by the White Book for a Strategy and Action Plan of the European Union passed by the European Commission in its 1997/599 Commission Proposal. In Spain the XVI transitory provision of the Electricity Sector Act established this same objective for the same year.
3. By the year 2010, 22.1 per cent of electricity will have to be generated from renewable energies in accordance with, although with indicative effects, Article 3.4 of 2001/77/CE Directive of the European Parliament and Council, 27 September, concerning the promotion of energy generated from renewable energy sources in the European Union electricity market.
4. Caps on the emissions of green house effect gas in every country belonging to the European Union: the 2001/81/CE Directive of the European Parliament and council, 23 October 2001, about national caps on emission of certain atmospheric polluting substances, establishes the obligation that, at the latest, before the year 2010, the European Union Members restrict their emissions of sulphur dioxide (SO₂), nitrogen oxide (NOX), volatile organic compounds (VOCs) and ammonia (NH₃) to the caps established in its Addendum I. Spain is allowed 746 kilotons of SO₂, 847 of NOX, 662 of VOCs and 353 of NH₃ at most.
5. Directive 2003/87/CE, of the Parliament and the Council, concerning the trade of granting emission licences had to be transposed before January 2005. The fact that it comes into force will mean that the enumerated plants in Addendum I (among them electricity producers) will have to enjoy the appropriate licence to be able to give off CO₂ in the atmosphere. Every State will establish in its own plan the amount of emissions that are going to be allowed in each period, of which the first starts in January 2005 and will last three years. This implies that Spain will have to foster as much as it can of its electricity production out of renewable energy sources, if it does not want its products to lose competitiveness with foreign ones, since the emission licences can be negotiated between individuals and companies from the European Union (Article 12.1, a).¹⁴ These emission licences will belong to the environmental integrated permission of the Spanish Act 16/2002 of 1 July, on Integrated Prevention and Control of Pollution.
6. Kyoto Protocol Confirmation by the European Union in May 2002 implies an engagement of cutting the emissions of greenhouse effect gas (GEG) by eight per

13 The Commission Proposal 'Sustainable Development in Europe for a better world: European Union Strategy for a Sustainable Development' (COM 2001/0264 final) increases the environmental engagements of the European Union for the year 2010 foreseeing by that date the total elimination of economic aid to the production and consumption of fossil gas.

14 According to Spanish research by the consultancy PriceWaterHouseCoopers, the implementation of the Directive will cost the Spanish economy the amount of €19,213 m in the span 2008–2012, in order to be able to finance the 123 million tons of greenhouse effect gas that will be given out beyond the agreed limit for the year 2010. Each ton will cost between €15 and 30, so the yearly outlay would increase between €1,800 m and 3,600 m. The research highlights that these expenses would make inflation increase 2.5% in the RPI, which implies a cutting of the GNP between 0.29 and 0.96%. The first consequence that comes to our minds is that these production cuts may suppose that many of the industries located in Spain will move to foreign countries with less environmental concerns. The research states for example that just the transport sector will increase its emissions in 98% by the year 2010, which will mean the sale of 58.2 million emission rights a year. After getting to know such a discouraging situation we have the feeling that the use of biofuels and biogas is even more necessary. From: Comsumer.es (a news item on 2 April 2004).

cent between 2008 and 2012 in accordance with the values of 1.990.¹⁵ Spain has a quota of positive emission that cannot go beyond 15 per cent. In a non-binding way, the Fifth Action Programme of the European Union concerning environment comprises, among its four areas of preferential action, the global reduction of emissions by the European Union by 70 per cent, in the long term, to face the effects of climate change. Recently, in the World Climate Summit in Montreal, the EU was happy to finally engage the United States in discussions on flexible methods to reduce greenhouse gases from 2012 onwards.

The REPP foresees that by the year 2010 Spain will produce 8,140 keot (kilo equivalent oil tons) of thermic biomass, 1,703 MW of electricity from biomass origin, 500 keot of electricity from biofuels and 78MW coming from biogas. Furthermore, it forecasts that the required investments to reach these objectives will be considerably lower for biomass (€3,299.6 m) than for wind power (€6,156 m) although the lowest profitability comes from biofuels which yield relatively little energy compared with the huge technological investment they imply (around €6,019 m).

We may say that the two renewable energy sources demanding the highest amounts of land are exactly those that will play a very important role in the production of clean energy: biomass and wind power. Despite being the sources with the highest current implementation cost all over Europe, the huge technological advances that have taken place in recent years and their reasonable production price make them the only feasible prospect for the fulfilment of such commitments.

Wind power plants exponentially increase every year all over Europe (especially in Spain), so that the demand for land becomes unsustainable. This huge demand for potential land has brought about the building of windfarms in the sea,¹⁶ where the installed power potential can be spectacularly increased without interfering to a great extent with other human activities. Bearing in mind that the Final Commission Proposal (98) 49 to the Council and the European Parliament, on 18 February 1998, promotes the withdrawal and removal of oil and gas sea plants no longer used and that the EU has shared domains in energy matters (Article I-13.2 of the European Constitution) and one of its objectives is renewable energy promotion (Article III-157 of the same), it would be a good idea that the building of windfarms in the sea could be carried out in a parallel and compensatory way in relation with such plants, allowing in some way that the company exploiting the gas or oil rig can replace them with a sea windfarm, or fostering (through the ALTENER

15 In order for the Kyoto Protocol to come in force we need the support of at least 55 countries that add up to, at least, 55% of the greenhouse effect gas emissions of 1990. The refusal of US to ratify it caused outrage, since this country produces 36.1% of worldwide emissions. Finally, Russia (17.4%) and Canada (with 3.3%) finally ensured that the Kyoto Protocol came into force on 16 February 2005. The efforts by the EU to fulfil its engagements have even outstripped its confirmation, although the fulfilment of the engagement is far away, since, although in the span 1990–1999 emissions had been cut by 4%, currently we are around a reduction of only 1%. See J.M. del Álamo Jiménez, *Requerimientos del Protocolo de Kyoto. Desarrollo sostenible y movilidad*, Secretaría General de Medio Ambiente, Gabinete Técnico, Madrid, 2.003, p 2.

16 The recent Spanish Royal Decree (Real Decreto) 436/2004, 12 March, by the Ministry of Trade, which establishes the methodology for the updating and systematisation of the legal and economic regime concerning the production activity of electric energy in special regime, mentions in Article 2 the wind plants placed in the sea (subgroup B.2.2.) stating that it will be the General State Administration, by means of the State Office of Energy Policy and Mines of the Ministry of Trade, which has the appropriate authority to grant licences to build, modify and to transfer (section 4), regardless of the installed power potential. Moreover, the Government will be able to fix for the sea windfarms, the right to receive a complementary incentive equivalent to 30% of the average electric rate or of reference every year (Art. 41).

Programme) their replacement by any other company.¹⁷ Bear in mind that currently there are around 600 oilrigs in waters of the EU, mainly in the UK and Norway.

On the contrary, biomass necessarily requires vast areas of land on the mainland which limits its future potential to good planning of the available land, in clear competition with other equally relevant uses, such as food production, protected open spaces, industrial plants or housing. Despite this great obstacle to developing biomass, we consider that the solution does not consist so much in increasing the amount of land meant for energy cultures, but in replacing part of the farmland now assigned to food production to produce biomass, taking into account to what extent these actions are compatible with the European Union Agricultural Policy (EUAP). At first sight, such a replacement seems to be feasible since it goes hand in hand with the support of an appropriate economic level of the farmers, to the creation of environmental protection in agriculture and to crop diversification, essential aims of the farming policy currently in force.

BIOMASS AND THE COMMON AGRICULTURAL POLICY

Biogas production has spectacularly increased in the EU since the 1992 EUAP reform. This has been possible, mainly, thanks to the new policy of direct payment of agricultural subsidies to farmers, as a compensating measure for reducing and abolishing intervention prices.¹⁸ Behind such a reduction was the intention to make domestic prices of our products more competitive outside the EU, a fostering measure, above all, to compete with the US or Russia in order to achieve a greater worldwide market share. The subsidies or direct payments were granted provided that farmers abandoned 10 per cent of their land (which has been called compulsory withdrawal quota¹⁹ for whose maintenance, direct aid was also set up) so that, when producing less, the purchase price increased and the surplus volume was reduced at the same time.

Price lowering intervention will certainly encourage an increase in the voluntary withdrawal of those lands where the cost-effectiveness of output is low, which could be used to produce energy cultures in the strict sense, to be reforested with the same end, or to produce grain (at the expense of oil seed sowing), and so ethanol output could be equally increased.

Thanks to this measure, the lands no longer used for the production of farming products have been slowly used to produce non-food cultures such as sunflower or rape-seed

17 We have to remember that in the Oral Report on the North Sea that took place in June 1995 the Commission was in favour of recycling and reusing the gas and oil rigs placed in the coastal area that are no longer used. The removal of these platforms by deliberately sinking or dismantling them usually brings about pollution problems due to the concrete, although it is true that the steel could be reused on the mainland as poles for the wind turbines. The Commission Proposal (98) 49, final demands that the disused gas and oil plants built after 1 January 1998 must be dismantled completely and recycled on the mainland provided this measure is feasible and can be carried out with complete safety.

18 Grain intervention prices have fallen €119.19/a ton in the 1999–2000 campaign to €101.31/ton in the 2002–2003 campaign, even though direct aid to grains has been increased from €54.34 to €63/ton in the same period. Nevertheless, in the case of oil seeds, the direct aid to output per ton has fallen from €94.24 in the 1999–2000 campaign to €63 (the same price as direct aid to grain) in the 2002–2003 campaign. The aid to flax is paid at that same price and a little more (€72.5) to protein products, although the aid to these have also been reduced since 1999, the year in which €78.49 was paid per produced ton.

19 The Agenda 2000 has established a compulsory withdrawal quota of 10% between 2000 and 2006. The maximum of voluntary withdrawal, that is one surpassing that percentage is arranged by every member state.

plantations with which vegetable alcohol²⁰ or biodiesel can be produced. It is thought that 90 per cent of these lands are already occupied by these cultures.

Notwithstanding, in Agenda 2000 no kind of aid for energy cultures had been planned, both grain and oil seed production and the maintenance of compulsory withdrawal lands received the same payments. Therefore, farmers had the choice to leave their compulsory withdrawal lands in an unproductive way or to culture them with non-food crops. In the first case the farmers received the bonus directly although they had to face the remaining expenses that these wastelands would bring about. In the second case, the farmers still received the bonus, to which they would add the selling price they could obtain for their rape-seed or sunflower crop, for example, although they would have to face the overhead expenses. In any case, bearing in mind that the farmer already had machinery and land, these costs were usually low. In conclusion, we could say the farmer's choice depended on the purchase price that biodiesel and alcohol or vegetable lubricant producers established in the market, and this price depended, among other things, paradoxically, on the oil barrel price worldwide.²¹

To avoid this connection, the measures finally adopted by Council Regulation 1782/2003, whose Articles 88–92 established an independent aid for energy crops (€45/hectare) are perfectly reasonable. This aid would be added to the aforementioned (and that would be accepted for its environmental aims from Article 95.4 EU or Article III-65, III-92.2 and III-57.1 from the European Constitution). These aids, moreover, won't cause problems in the World Trade Organization since these do not interfere with international trade of agricultural products (as their end is not for food), have a clear environmental purpose and temporary character. The mainstream objectives of European farm policy are similar. For example, it has promoted the replacement of maintenance aids of compulsory withdrawal lands devoted to energy cultures for a direct payment to energy crops, granted with the pedantic name 'carbon-credit', an incentive whose ultimate aim is replacing the carbon dioxide emission sources.²²

That incentive should complement the investment subsidy given to installations, so that from a double angle we would get the objective of giving priority to non-food cultures exploited as biomass. The carbon credit would be paid to farmers that had a contract with a processing company. With this the output of these crops is bound to a safe transformation into energy and possible speculations with the extra payments. Distribution among the member states would be done bearing in mind the historical production of energy crops in withdrawal lands and the distribution of CO₂ reduction.

20 It is not the same ethylic alcohol, used in spirits, cosmetic and pharmaceutical industries and for whose merchandizing there is a CMO, Common Market Organisation (a Rule Proposal by Council according to which is established the common organization of the market of agriculture origin ethylic alcohol (COM/2001/0101/final), as methylated spirit or methanol, used as biofuel.

21 The experience of energy cultures in compulsory withdrawal lands has been positive, which seems to imply that the larger part of raw materials for biomass must come from and keep coming from these and receive the same aid (at the very least) as the one that lands devoted to food cultures receive, being merchandised in the same way. Unfortunately, Spanish environmental conditions are not the best for the production of grains and oil seeds, more appropriate in Northern countries. However, the new negotiations with the World Trade Organization seem to allow new grain imports at reduced duty, which could be even assigned directly to produce ethanol in a cheaper way.

22 Spanish Act 43/2003, 21 November, concerning Forests, has also foreseen in a parallel way to the EUAP reform, the chance that the Administrations can grant incentives to forests for carbon absorption, with the aim to foster the exploitation as biomass of their forest uses (Art. 65.2 b) or simply the reforestation of areas to be used as 'green drains' with which the climate change effects can be lessened.

With the new system of aid to energy crops (whose aims are well defined in Directive 2003/30/EC, in relationship to the use of biofuels or other renewable fuels for transport) we get to dissociate the output of energy cultures from the yearly fee of withdrawal lands whose annual variability does not help the construction of a steady framework for the growing of biomass production assigned to gas and an increase of land available for these crops is foreseen as the voluntary withdrawal of productive lands is fostered. That is to say, it is hoped that the surface dedicated to these cultures will be greater than the one used so far, and so it must be if we want to fulfil the quota objective of biogas for transport, for the reduction of greenhouse effect gas and for the consumption of renewable energies.

As well as this, the exemption of biogas from the indirect tax on hydrocarbons is already taken for granted by the EU, which has been materialised in Spain for bioethanol, methanol (or methylated spirit) and vegetable oils in Act 53/2002, of 30 December 2002, on financial, administrative and social measures. This modifies the Special Tax Act imposing a zero rate to biofuels until 31 December 2012, whether to be used in an exclusive way or to be mixed and used along with fossil fuels. That would compensate the largest cost of production of biofuels.²³

Under this valuation, Boyan Kavalov estimates that, in 2010, a 5.75 per cent objective for transport biogas could be reached with the surface reserved for compulsory withdrawal lands, even without taking into consideration the entrance of the ten or thirteen new countries in the European Union as they need less land since their gas consumption for transport is much smaller in comparison with the measure of the fifteen.²⁴

If it is also a question of fulfilling the 22.1 per cent objective of renewable energy production for the year 2010 it is possible that new amounts of land dedicated to biomass must be added (around one per cent more). Notwithstanding, such an increase could be needed if new wind farms of greater power potential were created – something that is easily predicted. Nevertheless, if we add the land required for biomass, coming from the engagement of consuming the 12 per cent of energy from renewable energy sources for the year 2010, then we would need an important increase of land bound to produce renewable energy sources, between two and five per cent being optimistic and eight and 13 per cent pessimistic. Again, other external factors can reduce the land required. So, the increase of energy foreseen when implementing wind power or mini-hydraulic energy could reduce this percentage. Neither solar and geothermic energy nor biomass imported from other countries (Russia and the rest of the republics from the former Soviet Union) would not help to reach that objective.

Other scientists are more hopeful in their predictions and have calculated that, taking into account that the annual increase in the transport sector in Europe will be two per cent, the expected diesel oil and gasoline consumption for the year 2010 would be about 300 million equivalent tons of oil. In this way, the replacement of 5.75 per cent of this consumption for biogas would imply a reduction of 18 million equivalent tons of oil. To achieve this

23 In this reform proposal of the European Union Agricultural Policy (EUAP), Franz Fischler, has introduced measures that will not benefit the production of the biofuel raw materials, among them the reduction to €45/hectare and to a maximum of 1,500,000 hectares the aid to energy cultures.

24 Cfr. B. Kavalov, 'Land in need to fulfil the objectives of renewable energy policies in the European Union', p 4, in the IPTS Report No 80, 2003 Seville. In his opinion, even less land surface would be required if biogas was produced from beetroot and wood (ethanol), whereas the land required increases when it is a question of seed oil. However, the EUAP has bet on rape-seed and sunflower oil since these generate huge amounts of subproducts with other possible energy applications e.g., v. Gr. the joint production of heat and electricity by means of combustion.

objective the agriculture land devoted to compulsory withdrawal must produce crops generating biomass, without requiring an increase in the land availability.²⁵

BIOMASS AND FOREST POLICY

The use of biomass generated by forests could offset the amount of land thought to be required in order to fulfil international promises.²⁶ That could be reached in our opinion, from a double angle: by means of increasing the exploitation of biomass from the existing woods and forest plantations, or reforesting properties and lands previously assigned to agriculture. Neither of the two choices implies a true increase in demand for land, as we will see later on. Both choices are granted by EU aids in the recent Council Regulation (EC) No 1698/2005, of 20 September 2005, on support for rural development by the European Agricultural Fund for Rural Development.

This Regulation establishes a community farm investment aid which is devoted to modernising agricultural holdings, including energy crops. This aid must be compatible with agricultural aids financed by the European Agricultural Guarantee Fund, with a limit: no support under this Regulation shall be granted to schemes eligible for support under common market organisations.

The first choice is more than compatible with environmental protection and forest preservation aims. We know that the management or running of forestry does not have to mean preservation, understood as the complete absence of human intervention in woods. On the contrary, it is known that in order to manage a wood correctly from a biological point of view and to avoid forest fires, the systematic collection of stubble, branches and wood debris, the pruning of certain species at specific seasons or even the rotary wood cutting of rotten wood is advised. With all these products, after splintering and crushing, a manageable and suitably granulated product can be obtained to be used as gas in the production of electricity and heat. Unfortunately, prices are usually high.²⁷

The following three objectives of rural aid fit perfectly with the promotion of energy crop and biomass obtained from forestry culture:

- (a) improving the competitiveness of agriculture and forestry by supporting restructuring, development and innovation;
- (b) improving the environment and the countryside by supporting land management; and
- (c) improving the quality of life in rural areas and encouraging diversification of economic activity (Article 4 of the Rural Development Regulation).

25 See M. Ballesteros Perdices, *Contributions...op. cit.*, pp 5 and 6. The writer considers that in the campaign 2-00172.002 around 4 million hectares remained in compulsory withdrawal and 1.6 more in voluntary withdrawal. This surface, according to this research, would be enough to reach that objective.

26 So the REFP (p 155) has foreseen.

27 The chapter devoted to Biomass in the Renewable Energy Fostering Plan in Spain distinguishes that the difficult access of machinery to forests, the intrinsic humidity of wood and from the debris of pruning together with the work of cleaning, splintering and transport make the final gas price expensive, going slightly beyond the prices that the energy use can pay for. It is calculated that for such a price be competitive, a forest subsidy of about €300/hectare would have to be paid, which would place the product price at roughly €0.001/et or €0.0030/et. One et. is equal to 1,000 calories.

These three objectives must be implemented by means of the four axes defined in Title IV of the 2005 Regulation. The different aims of the four aid axes that could be useful in recovering forestry waste to obtain biomass are as follows:

Axis 1: Improving the competitiveness of the agricultural and forestry sector²⁸

Support targeting the competitiveness of the agricultural and forestry sector shall concern:

- (b) measures aimed at restructuring and developing physical potential and promoting innovation through:
 - (ii) improving the economic value of forests;
 - (iii) adding value to agricultural and forestry products;
 - (v) improving and developing infrastructure related to the development and adaptation of agriculture and forestry;
 - (vi) restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention actions.

Axis 2: Improving the environment and the countryside²⁹

Support under this section shall concern:

- (b) measures targeting the sustainable use of forestry land through:
 - (v) forest-environment payments;
 - (vi) restoring forestry potential and introducing prevention actions.

Axis 3: The quality of life in rural areas and diversification of the rural economy³⁰

Support under this section shall involve:

- (a) measures to diversify the rural economy, comprising:
 - (i) diversification into non-agricultural activities.

Axis 4: Leader³¹

The Leader approach shall comprise at least the following elements:

- (b) local public-private partnerships (hereinafter: local action groups).

In Spain, a disadvantage of the exploitation of biomass from woods (or forest exploitations, as Article 6 of the Forest Act 43/2003, 21 November, defines them) is the need for the disposal of resources at any time of the year which tapping different species in a variety of areas: for example, the pine trees in the Cantabrian Mountains and the gum trees in the southwest area of Andalucía.³² Andalusia (capital city: Seville) is one of the largest Autonomous Communities in Spain.

28 Article 20 Council Regulation (EC) No 1698/2005.

29 *Ibid.* Article 36.

30 *Ibid.* Article 52.

31 *Ibid.* Article 61.

32 In Andalusia, in 2001, a total of 24,027.86 hectares were assigned to gum trees, out of which more 90% are in the province of Huelva. Nevertheless since it is a not very popular tree for biologists, the expanse has sharply decreased in the last years due to the non-reforested tree fellings, so that from 1995 to 1999 a surface of 28.65% was lost. Out of woody cultures used as biomass there are only about 2,189 hectares, whereas,

By the year 2010, our forests would be capable of generating the equivalent of 450,000 tons of oil per year, thanks to the exploitation of around 150,000 hectares, which would demand a state investment of €28,307,670, reaching the equivalent of 220,000 tons of oil per year in 2006.³³

The Spanish Forest Plan (SFP) applies the Spanish Forest Strategy (passed in 1998) and it was approved by the board of Ministers on 5 July 2002. The Spanish Forest Plan, worked out by the Environment Ministry, is foreseen in Article 30 of the 2003 Forestry Act and, although it is in force for 30 years (up to 2032) it is to be revised every 10 years. Among its aims are encouraging the sustainable management of Spanish forests, improving forest production as an economic alternative and the engine of the rural development. The Plan echoes the Kyoto Protocol principles concerning the use of woods as CO₂ drains and the improvement of biomass use.³⁴ Fortunately, the arboreal biomass found in Spanish forest area in 1990 meant storage of 214,000,000 tons of carbon. The partial data from the Spanish Forest Plan indicate a remarkable increase in this storage and the increase of carbon sticking in the arboreal Spanish mass thanks to the forest management work which includes collection and withdrawal of stubble and branches.³⁵ By carrying out these tasks the Spanish Forest Plan considers that energy efficiency can be improved in Spain (even increasing, the reforested area, as a main aim of the Spanish Forest Plan) and the amount of CO₂ emitted reduced, thanks to the fact that the increase of forest biomass foresees the gradual replacement of fossil gas for biofuels. The measures of replacement of getting biomass from the collection of forest waste will also help to achieve that objective as not only is there an increase in the energy directly obtained from that renewable source, but by avoiding forest fires, CO₂ emission is prevented. Moreover, Spanish Forest Strategy warns how dead vegetable masses generate funguses and wood penetrating insects that attack live arboreal masses when their defences are low. The withdrawal of this biomass is, evidently, very beneficial in all senses.

among the grains, the areas dedicated to barley and rye were reduced drastically, as were the areas belonging to other grains. On the contrary, the stretch of properties cultivated with wheat slightly increased. Also the cultivation of potatoes went from 27,326 hectares in 1999 to 21,855 in 2001. The cultivation of sunflowers underwent the highest increase which makes us feel hopeful about a greater use of biogas, since its production went from 580,000 tons in 1999 to 870,000 in 2001. Also the area for corn increased considerably whilst that for beetroot decreased. We can sum up the situation in Andalusia with a lot of pessimism since the areas and outputs of raw materials suitable for the production of biogas and biomass in general fluctuate in accordance with EU subsidies, most of them decreasing. This confirms the necessity of the European Union Common Agricultural Policy reform, that, as we have mentioned, seems to implant the creation of direct subsidies to energy cultures. Source: Environmental Research by Environmental Council of the Andalusian Government, found in www.juntadeandalucia.es/medioambiente.

- 33 An ept (Equivalent Petrol Ton) equals the energy power freed due to the combustion of a ton of petrol.
- 34 The improvement of the capacity to collect CO₂ from the forest systems by means of the improvement of its efficiency in terms of biomass, through jungle actions, always fulfilled the principle of a sustainable forest management. Cfr. Spanish Forest Plan found on the net on Environment Ministry webpage: www.mma.es.
- 35 The work to obtain forest biomass thanks to forest management will allow to increase in 20% the current fixing capacity of such a product in the area under actions such as clarifying and making dense dismasted areas (1,344,000 hectares). In the implementation period of the Forest Plan this will mean an additional seizure of 6,700,000 tons of carbon by Spanish forest systems (see Addendum VI), to which we have to add the amount of non-burnt fossil gas when being replaced for bioenergy gas coming from such jungle activities. Furthermore, the collection work of this remaining biomass will have a socioeconomic and positive laboral impact at a local scale. The Spanish Forest Plan calculates the production of small branches from Spanish woodlands as around 2,000,000 m³ which equals to 1,600,000 tons. These branches come greatly from quercinea woodlands exploited as scrub in some cases ordered in a specific way with this main aim. Traditionally, these have been used as gas, although in the last decades they have stopped being used due to the general use of alternative sources like fossil gas.

But, apart from the exploitation of the existing woods, we consider that the value of agricultural woody waste from cultures such as olive trees, vineyards or fruit trees can be the help to avoid dedication of new lands to biomass production: pruning waste from these species along with the use of rinds from some dried fruits or from remaining olive-stone waste due to the conversion of olives into olive oil would imply a wonderful energy surplus to obtain energy through combustion. To the huge available area of these cultures in Spain we have to add the feature of being economically feasible since the olive oil, wine producer or the fruit trader could add to their income without an excessive added cost.³⁶

Agricultural herbaceous waste is also devoted to increase biomass energy already available in Spain: the straw coming from the collection of wheat, barley, rice and so on can bring about, through preparation and appropriate combustion, an amount of energy equivalent to 1,350,000 per year in 2010, and investments of €25.15 m.

If to all this we add the energy coming from forest industry waste (sawdust, splinters, cuttings, bark and so on) and from agricultural industries, by the year 2010 another 500,000 equivalent tons per year are expected to be added. The combustion of these products avoids the dumping of these products into rivers or aquifers, or decanted into ponds. The energy exploitation of biomass stemming from forest waste is going to be the topic of a National Strategy to be passed by government with the collaboration of the Autonomous Communities in accordance with the Additional Provision IV of the Forest Act 43/2003, 21 November.

On the contrary, the European Union Forest Policy promotes the transformation of agricultural cultures into wood cellulose energy cultures, of woody or herbaceous kinds, as an alternative to extensive cereals. There is already a surplus of this product in Europe, so new vacant land stretches will not be required. It would be a question of replanting black poplars, willow, gum trees (also thistle, although it is not a true forest species). This would have beneficial effects as these are cultures that do not need fertilizing or spraying and, what is more, avoid the erosion of lands that otherwise would be abandoned. Being wooded areas or scrub, a new natural habitat would be created for wild fauna. Furthermore, the above-mentioned species grow quickly, which would ensure the profitability of energy forest cultures in a span of about three years and have as an additional advantage that neither of them demands cultivable land (land able to be ploughed) in order to grow and they endure high levels of flooding. These features allow these kinds of cultures to settle in lands that otherwise would have little chance of being exploited. Therefore there would not be competition for land between these cultures and the agricultural ones.

Let us bear in mind that the question would not be, as we have aforementioned, assigning compulsory withdrawal lands to non-food cultures, but to the simple replacement of grain cultures for forest ones in order to obtain biomass. It is a kind of voluntary withdrawal that implies a change in use, that increases the amount of land dedicated to the production of biomass, but that does not suppose a new land demand rather the replacement of some already existing without taking into account the compulsory withdrawal lands motivated by the European Union Common Agricultural Policy. Moreover, we keep on advocating the existence of two types of autonomous aids needed for these energy cultures to be economically feasible: a general aid to cover the culture change (first forestation aids, as regulated in Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for

36 The Spanish Renewable Energy Fostering Plan considers that, by this means, around 350 eot a year could be added to the energy balance in 2010 coming from 875,000 hectares, with an investment of 'only' €22.027093 m within which €12.5 m are devoted to direct subsidies to the product.

rural development by the European Agricultural Fund for Rural Development (EAFRD)³⁷ or the voluntary withdrawal aid, provided the transformation had the aim of implanting energy cultures, and a direct aid to reforestation with the purpose of using the biomass of such cultures, this aid is thought to be of €0.003/eot by the Renewable Energy Fostering Plan (REFP), a transitory amount until prices are competitive in the market and conditional on the fact that the farmer had signed contracts with the dealer/transformer of biomass. The Plan considers that up to 1,000,000 hectares will have been reforested by the year 2010 producing about 3,500,000 eot a year. To sum up it could be estimated that biomass could generate in Spain, by the year 2010, a total energy of 1,708 MW with a production of 11,912 GWh a year of primary electric energy. This is equivalent to 5,100,000 tons of oil per year.

To all these figures we would have to add the energy coming from the thermic exploitation of biomass that would increase, in the year 2010 in accordance with the Renewable Energy Fostering Plan to 900,000 more eot/year, reaching a total of 6,000,000 eot/year of energy produced by biomass in 2010.³⁸

In conclusion, we can say that the energy production of biomass in Spain will not require new lands in the literal sense: but rather the replacement of some agricultural lands, resulting from the compulsory or voluntary withdrawal, for energy cultures.³⁹ However, biomass transformation into electricity and thermic energy will increase demand for new transforming plants whose land demand is reasonable but real and whose guidelines of

37 The forestation of agrarian lands was a complementary measure introduced by the European Union Common Agricultural Policy Reform in 1992. It is about subsidies in execution of Chapter VIII (Forestation aids, ex Art. 31) of EU rule 1257/99. However, the Rule does not mention anything overtly about biomass promotion. It is alluded to indirectly including the use of the forest exploitations (considering 38 and 40) but rather it seems to have as its aim true forestation with environmental purposes (ecological, basin protection and so on). So for instance, in Castilla-La Mancha, by means of the Agrarian and Forestation Programme, in the year 2003, 597 beneficiaries were paid subsidies which were assigned to the planting of 1,084.77 new hectares and to the payment of maintenance subsidies and compensations for the reforestation of another 4,235.8 hectares. Indigenous species have been used such as the evergreen oak, carrasco pine, the wild olive tree, the cork tree, the broom or the 'piñonero' pine. These are subsidies to forestation that do not demand biomass exploitation from the new cultures. Source: *La Cerca* Journal, Albacete, 3 July 2003. In Andalusia, the Rural Development Programme (2000–2006) grants subsidies paid by the Andalusia Fund of Agrarian Guarantee (AFAG). Since the implementation of the previous EU rule 2080/1992, a total of 175,493 hectares for new forestation in farmlands have been passed which generate acquired duties of €199.88 m between the years 2000 and 2006. In this new period we hope to face a subsidized area of 30,000 hectares, with an average of 5,000 hectares/year with the following amounts: forestation expenses (€1502,53/hectare), maintenance bonus (€240,40/hectare) and compensatory extra payment due to the change of culture (€120,20/hectare). Source: Andalusian Federation of Agricultural Cooperative Companies (www.faecagranada.com). Slow growing species are preferred because these are less harmful for the land fertility and because for the quick growing species, the subsidy is only provided for plantation costs and not for maintenance costs (of up to five years in some cases) nor for the income loss due to the forestation (up to 20 years).

38 The REFP even foresees the autonomous distribution of these amounts: so, for example, Castilla-León and Castilla-La Mancha would be the two Autonomous Communities heading biomass production in Spain, followed by Andalusia, Aragón and Extremadura. On the other, the ones that would hardly contribute to its development would be, in this order, Cantabria, Canarias, Baleares and Asturias. As for the quality of energy coming from biomass generated by forest waste, Castilla-León would maintain position but followed by Galicia, Extremadura and Andalusia. Andalusia would be first in biomass production from waste of forest and agricultural industry, thanks above all to its plantations of olive trees, vineyards and fruit. The complete investment in Spain to reach that objective is of €2,274.71 m.

39 The REFP considers that in 2010 the energy cultures will hold an area of: first choice about 814,190 hectares, 15% out of the total of each kind of the following lands: half arid, dry land, humid dry regions, dry land of high potential and irrigated lands suitable for cereals. As a second choice it would be a question of advocating an occupation of 1,000,000 hectares in half arid dry land since these are the most appropriate to allow more economic margin of exploitation for the ploughman, bearing in mind the subsidies currently granted (p 137).

planning and placement require the proper approach in town and country planning policy that we will deal with now.

IMPLICATIONS OF RENEWABLE ENERGY SOURCES (AND, ESPECIALLY, OF BIOMASS) IN THE ANDALUSIAN TOWN AND COUNTRY PLANNING POLICY

INTRODUCTION

In accordance with Article 148.3 of the Spanish Constitution (1978) the 17 *Comunidades Autónomas* (Autonomous Communities) can assume competences in the matter of town and country planning, urbanism and housing, which they have assumed in their Statutes (*Estatutos*) with the character of exclusive rights. Nevertheless, this assumption is not absolute: the fact that Article 149,1 of the Constitutional Text does not include a specific State competence on such matters does not exclude the possibility that the State can execute competences of diverse content interfering with town and country planning, but whose exercise necessarily demands their projection on the land.

A fundamental piece of the doctrine of *Tribunal Constitucional* is that:

the exercise by the *Comunidades Autónomas* of this exclusive competence has the purpose of defining a global policy for their territory, with which they have to coordinate the public and private performances that affects the same and which, for that reason, cannot be avoided by the different Administrations, including the State.⁴⁰

For this reason, each *Comunidad Autónoma* has passed its own Town and Country Planning Act, regulating different instruments of planning, varying from a general one, comprising all their territory, to comarcal or regional plans. In these, *Comunidades Autónomas* use to set out the zones eligible for settlement of industries, energy plants, roads, public works, agriculture, and so on, and their content is divided into 'norms' (which are compulsory), directives (only compulsory in their objectives) and recommendations (voluntary).

THE ANDALUSIAN CASE

In Andalusia (*Andalucía*, the largest Spanish *Comunidad Autónoma*, located in the south) a Country Planning Law was passed in 1994, called *Ley 1/1.994, de 11 de enero, de ordenación del territorio de la Comunidad Autónoma de Andalucía*. The Andalusian Town and Country Plan (*Plan de Ordenación del Territorio de Andalucía* (henceforth POTA)) is almost finished, a vast and very ambitious document which aims to contain all the guidelines of country planning in all its territory. By contrast, individual regional plans have also been passed, and are applied day after day. The actual Andalusian Town Planning Act was passed in 2002, called *Ley 7/2.002, de 17 de diciembre, de Ordenación Urbanística de Andalucía*.

How are about biomass transformation plants accommodated within the planning system? Let's take a look. All the raw materials needed to produce biomass need to be transformed into energy using different processes of fermenting, combustion or anaerobisation. That supposes the creation of transforming plants whose geographical

40 STC 40/1998 of 19 February, FJ 30.

placement is, at first, free for the exploiting company,⁴¹ although it will have to be compatible with the town and country planning plans.⁴² Energy planning has a clear relationship in the autonomous and subregional town and country planning plans.

The REFP considers it necessary not just to build transforming plants but also to give out plants of biomass, or, what is the same thing, places for the continuous reception and sending out of biomass with which to supply in an endless and scheduled way the different transforming plants of the region. These plants could decentralise into agencies, franchises, and so on, all over the Autonomous Community area with which the ploughman would sign contracts of raw material supply.

The greatest part of biomass is devoted to the manufacture of biofuels or biogas, although it is increasingly used as gas to produce electricity directly. In these cases, the Act 54/1997, 27 November, on the Electric Sector, establishes full freedom to install generating electricity plants. This way, any installation devoted to the production of electric energy from biomass combustion is welcome, provided that it obtains the mandatory administrative authorisation, whose granting will depend on objective criteria, among which we find the environmental protection (which supposes the largest part) and their compatibility with town and country planning. The Act considers that the electric energy production from biomass or biofuel is made under a special regulation, provided the installed power potential in the generating plant is under 50 MW.

The Act grants a special extra payment to the plants producing electricity provided with biomass whenever their installed power potential does not go beyond 10 MW so that the price of the electricity sold by this type of installation fluctuates between 80 and 90 per cent of the usual market price (Article 30.4).⁴³ Extra payments can also be established when the plant supplied with biomass surpasses 50 MW (Article 30.5) which is fairly logical if we take into account that the installed power potential is the least important, whereas the production system used is always clean and beneficial for the environment.

State planning of the electricity production (or electric planning) is limited to transport installations that should be included in the town and country planning. But since the Act 54/1997 came into force, the State has deregulated the installation of producing plants and the investment decisions of electric companies. Planning has been replaced by an indicative scheduling of the parameters under which the electric sector is supposed to develop in the years to come in order to promote private involvement and investment. Therefore, the State electric planning, at most, will foster the installation of plants producing electricity from renewable energies (including biomass) under a special set of rules established for this purpose under Article 4.3 of the Electric System Act (No 50/1997), but will

41 The location of the plant producing electricity, although it be from biomass must be made explicit by the installation licence applicant (Art. 21.2, c ESA) and that, in the installations authorised by the General Government Administration (for our research it would be about installations generating electricity from biomass with an installed power potential beyond 50 MW) it will be included in a Memorandum that belongs, at the same time, to the installation preliminary sketch (Art. 123 Royal Decree 1955/2000, 1 December) according to which the activities of transport, transmission, commercialisation supply and procedures authorising the electric energy plants are regulated.

42 So, for example, in the installations producing electric power authorised by the State (Art. 120.2 Royal Decree 1955/2000, 1 December), by means of which the activities of transport, transmission, commercialisation, supply and procedures authorising the electric energy plants are regulated.

43 Fortunately, those plants dedicated both to the transformation of biomass into biofuels, biogas, alcohol or non-food oils and to the production of energy will receive another extra payment to the production even when its installed power potential goes beyond 10 MW provided they do not exceed the 25 MW (Transitory Provision VIII).

not locate or impose the technical features of the same. This measure specifically affects plants producing electricity from biomass whose planning will not be done from the State economic plans but from the energy and autonomous planning plans. The compulsory state electric planning is therefore limited to transport installations mentioned in the Royal Decree 1955/2000.⁴⁴

Anyway, the location of plants generating electricity has an obvious spatial projection and implications for the town and country planning system, so precautionary measures are be advisable. The Order PRE/472/2004, 24 February, which created the Interministerial Commission for the energy exploitation of biomass, demands that the Autonomous Communities inform this Commission whenever their town and country planning, industrial or agricultural plans mainly affect the planning of biomass energy exploitation.

The indicative state electric planning includes the electric production objectives of the REFP that foresees the increase in the involvement forecasts of renewable energies in the Spanish electric production, mainly from biomass, wind power and thermoelectric. And not only does it include them but it goes further in its power potential estimations in special regime as the energy planning of electricity and gas, passed by the Ministry of Trade for the years 2002–2011, foresees that by the year 2011 there will be an installed power potential of electricity generated under the special set of rules of 35,733 MW, out of which biomass would contribute about 3,176 MW (biogas included).⁴⁵ This document foretells the necessity of having installed, for this last year, 26,000 MW more of electricity generated under the special set of rules and 14,800 MW more in ordinary regulation, only to be able to satisfy the predictable demand at such date. In 2002 the Ministry had at its disposal enough applications to install generating electricity plants under the special set of rules to produce 40,000 MW (mainly in wind farms, but also minihydraulic, biomass and cogeneration). Of course, the amount of power potential that will finally enter into service is unknown, due to various determining factors: such as environmental town and country planning and urban and technical factor which suggest ignoring such applications.

Nevertheless, taking into account that since the Electric Sector Act there has not been a public ownership of the electric service, which has been liberalised, and that electric planning restricts itself to transport installations and electricity transmission, the actions in such plans (in Andalusia, for example, Andalusian Town and Country Planning Plan) will hardly be able to compulsorily plan the location of electricity producing plants, unless it was a decision based on a previous applications of a private or of an urban covenant –

44 The State planning of electric energy transport and transmission installations will have to be coordinated with the autonomous or subregional plans of town planning. These will oversee these buildings when they are located or appear in lands not designated for building, and with the General Urban Planning Programme or the town subsidiary rules when these settle in urban or building land, specifying the possible installations, rating the lands appropriately and establishing, in both cases, the required land reservations to place the new plants and protect the already existing (Art. 5, Electric Sector Act). In an indirect way, the state planning is dictating the location of the plants or installations producing electricity (in ordinary or special regime) as a company will hardly install an electric plant from biomass if the nearest electric supply line is miles away or if the electricity transport network of the area is outdated or not very compact since it will have to pay with its own money the connection costs and the installation of connection facilities (substations and so on). Anyway the investments foreseen in the planning of electricity transport networks can be justified to allow the connection or access of the producers what confirms a kind of determining factor of the planning to private enterprise installing producing plants (Arts 9.1, a 3 and 16.2 b) of the Royal Decree 1955/2000, 1 December which regulates the activities of transport, transmission, commercialization, supply and authorising procedures of electric energy installations).

45 The energy planning of electricity and gas can be found in the net, in the webpage: http://www.mineco.es/PlanificacionEnergetica2002_2011/.

whose feasibility being foreseeable – that will belong to the content of the town and country planning plan or the corresponding general urban planning plan. Anyway, it seems to be very difficult and would border on the contravention of Article 38 EU that the plan contains very detailed binding lines of the exact location of the plant, its dimensions and power potential. But, if the plant is sited on urban or building land, the General Town and Country Planning Plan will be in charge of determining the Execution Units which it establishes and the required execution system for its urbanisation and building.

On the contrary, if only the Town and Country Planning Plans (autonomous⁴⁶ or sub-regional) would include among its prescriptions the main lines of the very indicative electric or energy planning. With this it would be a question of co-ordinating both kinds of planning, carrying to the territorial plans the indications about the endowments and general systems of electric production and renewable energy that would be mainly about location, fostering measures for the building of production plants or biomass or wind power transformation, desirable power potential on installation and so on.

In Andalusia, the installation of plants producing biomass or transforming electricity from renewable energies could conform by means of Public Interest Actions of article 42 of the Andalusian Town Planning Act 7/2.002, 17 December (henceforth ATPA). It is a new urban figure for peculiar public interest actions in green belts, whether of public or private promotion and in which the requirements of public benefit or social interest are found. The figure perfectly fits the facilities producing renewable energies since the Act demands that these actions do not promote the creation of new population settlements (a condition that this type of facility fulfills) and that they have specific ends such as industrial, supply of equipment or services. The ATPA forbids the consideration of public interest actions to those outstanding interventions or infrastructures for which the local legislation already establishes a special procedure of reconciliation with the town planning.⁴⁷ These public interest actions, when they deal with the installation of a electricity producing unit from renewable energy sources will have to be passed as special plans since they usually have territorial impact and affect the structural planning of the corresponding general town and country planning plan (Article 10.1, paragraphs Ac, 2 and Bc of ATPA). The special plan, whose final approval belongs to the Town Council, will have to predict the situation, the location and the delimitation of the installation, its socio-economic features and technical qualities, as well as the periods to begin and finish the work. Once the special plan is passed, the promoter of the activity will have to apply for a municipal licence for a maximum of one year.

Moreover, it is more logical to think that the installation of plants producing or transforming electric energy from renewable energy sources affect town planning. We have already mentioned that the best would be that the town planning plans from each

46 The project POTA foresees in ch. 4 as objective to be fulfilled in relation to the Strategy of Basic Regional Infrastructure Systems 'to endow the region of an Energy System based on the diversification of energy sources and the primacy of rational management policies of renewable energy demand and promotion usage'.

47 The regional legislation concerning installations producing electric energy from renewable energy sources does not usually establish this coordination at autonomous level. Let's remember that Royal Decree 2818/1998, 23 December, regarding the production of electric energy by installations supplied with renewable energy resources or sources, waste and cogeneration in its final Provision 1^a establishes that the installing procedure collected in the same is not basic for installations of autonomous authorization, and that for the present we lack, this procedure in Andalusia. The Andalusian Energy Plan (AEP) cannot be so qualified since it is a very general co-ordinating plan of energy and saving policies and diversification of energy, but not with the territorial. Anyway, in such a Royal Decree, little or nothing is mentioned about the coordination of renewable energy installations with the urban activity.

autonomous community or, even better, the subregional from each of them, due to its greater flexibility and concretion, included among their precautionary measures or main places of settlement of these installations in an indicative way. However, very few of those already approved in Andalusia for example have anticipated such actions.⁴⁸ So we could think that these installations are actions with an impact on the town planning as has been foreseen in Article 30 of the Country Planning Act in the Autonomous Community of Andalusia 1/1994, 1 January.

This kind of action requires the emission of a report by the proper autonomous authority that justifies the coherence of the same with the passed town planning, and would sign, in its case, the correcting, preventive or compensatory measures that should be applied whenever such compatibility was not complete. It may be the case of facilities affecting the system of cities or the main communication axis and/or basic infrastructures of the system of transport, telecommunications or energy. Apart from the installations for waste processing however, neither of the attachments to Act 1/1994 foresees as possible actions affecting the town planning the ones of production or transformation of electric energy, it seems to be evident that they should be qualified so, bearing in mind, along with the affectations already mentioned, their negative influence for instance, on human settlements, agriculture, cattle raising and so on.⁴⁹

The draft bill belonging to the Andalusian Act of Renewable Energies, Saving and Energy Efficiency has corroborated some points:

1. The necessity of our Autonomous Community to be endowed with a renewable energy plan, the so-called Andalusian Plan of Renewable Energy Pre-eminence that will be passed by Decree of the Government Council.
2. That this Plan will be considered as a plan affecting the town and country planning of the Attachment I of the Country Planning Act 1/1994 in Andalusia.
3. That it will be possible to work out territorial plans of renewable energies for specific areas, pending the approval of the plan with Pre-eminence of Renewable Energies. Such plans will contain a renewable energy map of Andalusia defining those stretches of the territory that join the best conditions for these energies to be used, specifying in each case the renewable energy sources and their potential. These will be called areas with Pre-eminence of Renewable Energy Use (APREU).

48 So far only three subregional plans in Andalusia foresee a certain exploitation of renewable energy sources. On the one hand, the Decree 102/2001, 24 April, by means of which it is decided the formulation of the Town Planning Plan of Janda, in the province of Cádiz (published on 19 May 2001, BOJA (Official Gazette of the Andalusian Government No 57, 2001) indicates in its Report of Causes that the natural and landscape resources are the basis of development of this area in the province of Cádiz, since the actual potential for the agrarian and tourist development and for the generation of wind power base themselves in their exploitation. On the other hand, the Town and Country Plans of the west and of East Almería are richer on the subject, above all, in the exploitation of solar energy, as a complement to energy production of rural areas. We miss some indications in other plans as, for instance, the use of waste from the olive industry as biogas or gas for combustion in the Town and Country Planning Plan of Sierra de Segura (Jaén) as it is foreseen, by the way, in the Document of Territorial Diagnosis from the POTA (ch. 2, 1^a) 2, p 70.

49 Attachment I to the Act 1/1994 considers as planning activities those of development and the operative programs a territorial area. If it was a question of investment plans in especially poor areas, it is reasonable to think that these include installation precautionary measures of production energy plants. The Andalusian Energy Plan (AEP) passed by the government council through Decree 81/2001, on 13 March, that agreed its formulation for the period 2003–2006 discusses investments in energy matters in those areas lacking it most, that is to say, the North and East zone of Andalusia (p 154). The AEP envisages that it will reach 15% of renewable electric energy production in 2010 (mainly through wind power, biomass and solar energy) and diversifies and expands its implementation all over the territory of the Autonomous Community without centralising it in concrete areas.

4. That the forecasts mentioned in the plans above will have to be included in the environmental plans, in the town and country planning plans and in the urban plans regulated by the autonomous legislation as we have already advanced.
5. The installation projects to obtain useful energy from renewable energies that are not found within an APREU will be considered as actions affecting the town and country planning of Attachment II of the Country Planning Act 1/1994 in Andalusia, according to the foretold effects in Articles 30 to 32 of the same.

Also the town planning is supposed to play a main role in the promotion of renewable energies, bearing in mind, for instance, the type of buildings in each zone of the city and their potential to use solar energy, for example, as a source to generate electricity and heat. The new buildings would require the compulsory facilities to exploit renewable energies, something that is already foreseen in Andalusia by the Draft of The Renewable Energies, and of the Saving and Energy Efficiency (Article 7,1,c) about the energy certificate or CENER according to the Attachment II. 1, about solar energy).

Apart from these forecasts of *lege ferenda*, therefore, the Forestry Act 43/2003, 21 November, has already created new Forest Resource Planning Programmes (FRPP). These fall under the control of the Autonomous Communities, and in which these will have to foretell, as possible content, the forecasting and location of forest industries among which those devoted to the energy exploitation of the forest biomass are found (Article 31).

CONCLUSION

Biomass, defined as 'the biodegradable fraction of products, rubbish and waste from agriculture (including substances of vegetable and animal origin), from the forestry and related industries, as well as the biodegradable fraction of town and industrial waste' is the source enjoying the highest prospects of an increase in use in the near future in Europe. Despite sharing this development potential with wind power, it has the added advantage of being able not only to produce electricity but also to be used as biofuel or biogas for thermic energy or fuel for the running of boilers and machines.

Apart from the unquestionable environmental advantages that biomass use implies as a renewable energy source, the demands coming from the town raw materials from which it is secured (non-food energy cultures, woods or reforested lands) raise a land demand in the short and medium term that directly conflict with other more traditional uses of the same, such as stockbreeding or residential ones.

If we add to this the requirements and engagements made by the European Union in relation to the development of renewable energy use, we will understand the importance of establishing a fair town and country planning policy as a basis for energy planning. Among those engagements, we can quote, due to its impact, Directive 2003/30/EU, 8 May, of the Parliament and Council, concerning the promotion of biogas use or other renewable gas for transport. It advises that the two per cent out of the total gasoline and diesel oil consumed by the European Union road transport be replaced by biofuels before 31 December 2005 and that such a percentage be 5.75 per cent before 31 December 2010. Also by the year 2010, 22.1 per cent of electricity will have to be generated from renewable energies, as hinted, although also with indicative effects, by Directive 2001/77/EU of the European Parliament and Council, 27 September, concerning the promotion of electricity from renewable energy sources in the domestic market.

Bearing in mind that land is a limited resource, it would be mainly a question of re-using land that is already available. The supply of new land for use as an energy source for biomass has been so far supported thanks to the quota of compulsory withdrawal lands coming from the Common Agricultural Policy of the European Union. However, it does not seem to be enough to face the ambitious development aims for renewable energies, so it is essential to look for imaginative solutions. Among them, we plead for the sustainable exploitation of resources from protected open spaces or, above all, for the change of use of low agricultural output lands that could be cultivated with plants of high energy efficiency (thistle), or cereal (from which bioethanol is obtained) or reforested with quick growing species (gum trees, black poplars, willow trees and so on). In order to foster this change of use we would have to set up a new subsidy aimed at biomass production along with those already given for compulsory withdrawal or grain yield. These measures would, in the short term, make the production of biomass or biofuels (biodiesel, methanol, and so on) viable in the electric energy market.

A fair promotion policy of biomass and renewable energies must be founded on an appropriate town and country planning policy that provides the locations of the plants of biomass production, transference, or processing in its Autonomous or Regional Plans. Its instructions should be, by force, indicative, given the nature of electric planning and the due respect to the right of company freedom in Article 38 EU, but the installation of the same could be promoted by means of suitable fostering measures, after the manner of the Industrial Centres set up to protect our old economic planning.

In this research we have commented briefly how in Andalusia the installation of plants producing biomass or processing electricity from renewable energies could conform through the so-called Public Interest Actions of Article 42 belonging to the ATPA; or how the Andalusian Draft of Renewable Energies and Saving and Energy Efficiency defends working out territorial plans of renewable energies for specific areas (named Areas with Pre-eminence of Renewable Energy Use), where those zones enjoying the best conditions for the usage of these energies will be defined specifying in each case the preferred renewable energy sources and their potential.