Observations on Light Pollution aspects of the Wicklow CDP 2021-2027

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General introduction

Although light pollution does not currently have a legal definition in Ireland, it is a topic that needs to be addressed given its implications for climate change and the related impact on biodiversity. Both of these are current existential challenges and of major relevance with regard to their implementation at the local authority level. In the Irish context there are well-known effects of light pollution such as on moths, bats and birds, but many others, including potential human health effects, have also been noted. Even for cases where the impact of light pollution itself is relatively minor, the concurrent increase in both light level and the shift to blue-rich lighting can combine with the impact of climate change to push species over the brink and hence careful thought needs to be given to the use of light. Additionally, lighting has been revolutionised by LED technology, and this is a very new technology which is maturing rapidly and whose effects are only now being appreciated and studied. While energy considerations have been the prime driver behind the move towards high efficiency LED lighting, it is becoming increasingly apparent that the production of more light more efficiently – particularly in the blue portion of the spectrum with the introduction of white light LEDs – ignores the other, less beneficial, aspects of light due to our previous species-biased view of the lighting spectrum. Indeed, professional measurement of light levels (e.g. in terms of lumens, candela or lux) is biased towards the peak of human (daytime) vision and ignores the impact of lighting on our night vision, hence resulting in installations which appear brighter and also more glaring than desirable, particularly for the older population. Recent work has highlighted the effect of lighting on multiple species, including not only moths (which are important pollinators), bats and birds but also other mammals, fish, and even trees and other plants. In this context, the realisation that two-thirds of Ireland's native mammal species are nocturnal – with some endangered – should be cause for concern.

Because of the seriousness of the current situation in terms of the effects of climate change and biodiversity loss, concerted action needs to be taken across society, including in terms of lighting impact to halt, or reverse, these effects. In this regard, lighting is the only form of pollution which can be removed at the touch of a switch, although its effects can be longer lasting. Light pollution, interpreted as "unwanted light" can also have effects beyond the obvious and we will illustrate this with two brief examples. One case is the illumination of hedgerows beside roadways: hedgerows are recognised as important for biodiversity, but also serve as routes navigated by bats, particularly the larger species, as they traverse between roost and feeding areas. If light is shone on a hedgerow, it can restrict the passage of bats, thus entailing longer journeys and the potential denial of feeding areas. Another case is illumination of waterways from nearby roadways or bridges, as even low levels of illumination can serve as a barrier to the passage of fish such as eels, salmon and trout, and also increase predation through behavioural changes.

From the above, necessarily brief, review it can be seen that, even without specific legislation to address light pollution, it should be considered as part of the overall environmental package which needs addressing when biodiversity and similar issues are discussed.

Biodiversity and light pollution

In January 2019 the EU revised its Green Public Procurement (GPP) Criteria for Road Lighting and Traffic Signals, known as the GPP, to give attention to reducing light pollution.[1] The revised EU GPP advises stakeholders on implementation once they decide to install new lighting. It covers new

[1] https://www.europarl.europa.eu/RegData/etudes/STUD/2017/602065/IPOL_STU(2017)602065_EN.pdf

lighting installations, retrofitting of different luminaires, light sources, or controls in existing installations, and simple replacement on a like-for-like basis in existing installations. The GPP update employs an 'As Low As Reasonably Achievable' (ALARA) principle which is consistent with the Low Impact Lighting (LIL) standard promoted by German, Italian and Slovenian members of the European Environmental Bureau over the past decade. ALARA sets appropriate light levels for road lighting and traffic signals and is consistent with the overall EU approach to the precautionary principle of avoiding harm. There are allowances for reducing light levels when traffic flow is anticipated to be lower through the use of dimming, or the reduction of the hours of operation (trimming). Of course, ALARA comes with challenges since what is light pollution for one person can be acceptable or even desirable to another. Moreover, as the night has gotten brighter, people's conception of normal levels of light has changed and the precautionary principle approach requires that the lighting be justified, rather than the reverse. When the additional cost of installation, operation and maintenance is taken into account, a conservative approach to lighting also has real-world benefits for the council in terms of balancing budgets and reducing charges to its citizens, as well as a win for the environment. Furthermore, statistical appraisal of the effects of the UK's move to "trimming and dimming" has shown neither crime nor safety issues from this approach.[2]

More recently, in June of this year the EU Parliament recently adopted a text for the 2030 EU Biodiversity Strategy which, for the first time, addresses the topic of light pollution in this context.[3] The relevant sections of the document are attached in the Appendix at the end of this document. Note that these resolutions refer to the reduction of *light* rather than the reduction of energy use in lighting, so mark a change in approach. Although this resolution is non-binding, it does indicate future directions and should be taken into account in planning for the period of this CDP.

<u>Lighting and rural development</u>

The Department of Rural and Community Development published a policy entitled "Rural development policy Our Rural Future: Rural Development Policy 2021-2025" on 29th March 2021 which lays out the requirement to develop a national Dark Skies strategy.[4] This action is listed as Policy Measure #40 which ties in with the "Decent Work and Economic Growth" and "Climate Action" strands of the Sustainable Development Goals. As the period of this plan covers the period of the County Development Plan, the CDP should be aligned with the actions required under this national strategy. The DRCD policy relates to strands to develop aspects of Ireland's unique tourism, culture and heritage and, besides the leadership provided by the Department of Rural & Community Development, the additional relevance is that other bodies listed include Local Authorities in conjunction with the NPWS, Fáilte Ireland, and other relevant stakeholders. Dark Sky Ireland has been in discussion with DRCD and other government departments and is currently involved in providing information to feed into future planning guidelines.

Based on our measurements within Wicklow and experience elsewhere, we believe that preservation and protection of the night-time environment of Wicklow can provide for the development of off-season tourism and provide opportunities for increased environmental awareness. Studies undertaken for the Council show that relatively dark rural areas exist in the county and this, coupled with the proximity of populated areas provide opportunities for the development of tourism. In this regard, the popularity of the annual Star-B-Q organised by Astronomy Ireland in Roundwood is noted, with up to 500 people attending in previous years.[5]

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[2] https://evidence.nihr.ac.uk/alert/reducing-street-lighting-doesnt-lead-to-more-road-traffic-accidents-or-crime/

[3] https://www.europarl.europa.eu/doceo/document/TA-9-2021-0277_EN.pdf - see also Appendix

[4] https://www.gov.ie/en/publication/4c236-our-rural-future-vision-and-policy-context/#

[5] https://astronomy.ie/star-b-q-2021/

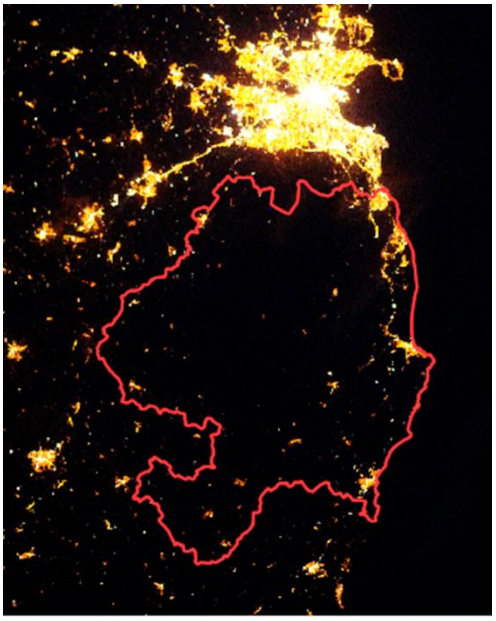

Figure 1: Wicklow as seen from the International Space Station in 2015

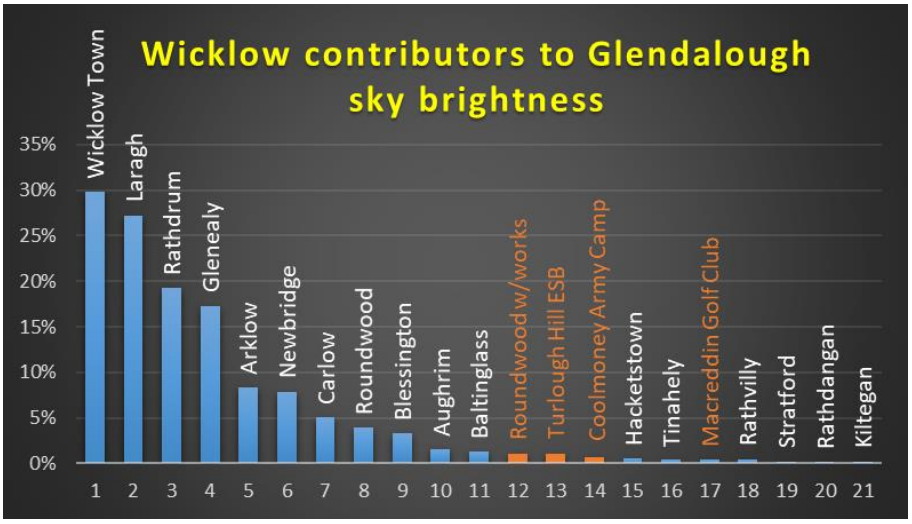

Figure 2: Contributors to the brightness of the sky at Glendalough Upper Lake. Note that brighter locations which are further away can contribute as much as less bright, but nearer ones. Locations are mainly CSO settlements, though a number of individual sources are highlighted. Also note the Glenealy contribution is relatively large and dominated by the contribution from greenhouses which have a peak radiance roughly ten times as large as that of Wicklow Town Centre. The contribution from the Waterworks at Roundwood is roughly 30% that of the town as a whole.

<u>"Warmer" (lower colour temperature) lighting</u>

With the widespread introduction of long-life white light LEDs to meet energy efficiency targets has come an appreciation that the blue content of such light can have deleterious effects on the environment, biodiversity, as well as raising glare and, at higher light levels, sleep disruption and potential human health issues. To take one concern, the reported worldwide decline in insect populations has been at least partially laid at the door of the increasing night-time light levels. Research published recently has examined the specific impact of different streetlight technologies on lit road verge and hedgerow areas, as well as the effect of introducing light into former dark areas. Reductions in insect numbers of one third to nearly one half were observed and development changes perceived amongst insects, with the blue-rich LED light being more detrimental than older

streetlight technology. Such changes may then impact on songbirds, which are also in decline.[6] In terms of the wider impact, blue light scatters some distance from its source and gives rise to a screening effect on the night sky and, as human night vision is much more sensitive to this part of the spectrum, this would have an impact on the rural development goals discussed previously.

The awareness of the disruptive nature of the blue content of lighting, the increased perception of glare from such sources, and the rapidly-improving efficiency of lower correlated colour temperature (CCT) has led to an increasing adoption of warmer-coloured lighting with a drive towards "warm white" lighting with a CCT of 3000K or less, and this was also a stated outcome of the EU GPP review mentioned above. In the UK such lighting is becoming more standard, particularly for residential areas, and even lower CCT lighting is likely to be adopted. Warm white lighting is similar to the temperature of halogen light as used in shops to provide better colour discrimination and has safety benefits in low-visibility conditions and where older people (who suffer from eye conditions such as cataracts) are concerned. This light is also perceived as more "friendly" and is therefore worthy of consideration in terms of making the outdoor environment more welcoming, particularly with the growth in outdoor dining and the push to boost service industries and attracting people back into town centres post-Covid.

The national Road Management Office (RMO) provides for measure of local autonomy in terms of move to lower CCT lighting. As an example, Mayo has adopted 2700K LED lighting on a number of routes, including on the N59 via. Newport town to improve the environment as well as to reduce light pollution. In consultation with the NPWS, adoption of warmer lighting – including, potentially, amber lighting in more sensitive areas – as well as "trimming and dimming" of lighting levels should be considered for more environmentally-sensitive areas.

Recommendations

We summarise with a list of recommendations below. We applaud the CDP's reference to the Institution of Lighting Professionals (ILP) lighting guidance and support the measures recommended in the latest version of the ILP guidelines, including careful lighting design, control of light in terms of time and location, and consideration to be given to lighting with a low blue content.

Our specific recommendations are as follows:

- Update the ILP guidance on light pollution to the latest version (GN01-2021) and also include the recommendations of ILP GN09:2019 "Domestic exterior lighting, getting it right!" in order to limit other lighting, including advertising.[7] Practice should reflect other recommendations as provided by the ILP, e.g. in their Exterior Lighting Diploma course, including:
    - Recognise that light is not a right, but needs to be justified on each occasion, e.g. on safety grounds and, given the importance of the environment, consideration should be given to the reduction in light level or duration and, potentially, the reduction or removal of existing lighting in egregious cases, particularly in environmentally sensitive areas. Reduction in light use benefits the environment as well as saving energy and carbon use. "Light what is necessary, for the time necessary, with the least amount of light necessary."[8]
    - Determine and assign, in conjunction with other stakeholders such as NPWS, environmental zones which will guide future planning including of lighting.

[6] https://advances.sciencemag.org/content/7/35/eabi8322/tab-pdf
[7] ILP Guidance Notes are freely available from: https://theilp.org.uk/resources/#guidance-notes
[8] e.g. attention is drawn to TII practice in removing unnecessary lighting from motorway junctions in line with current lighting standards

- Put an integrated lighting plan in place for the county which would serve to maintain consistency in both time and space and which could be used to inform, and reflect, planning decisions. There is flexibility within the application of lighting regulations for authorities to reduce public lighting levels and duration but the ILP recommends that a lighting plan is in place in order to justify the choices made and to provide their basis.
- Move towards the use of “warmer” (lower CCT) lighting which has a lower blue content and is shown to be both less environmentally intrusive, has a better visual appearance and is less disruptive of human sleep and, potentially, health.
- Carefully consider the design of the entire lit area when installing new lighting, as existing lighting, e.g. road lighting, may provide sufficient lit level for adjacent footpaths or cycleways, thereby removing the necessity to add additional light which, by its location, will also have an effect of neighbouring hedgerows and/or water courses.
- Consider the effect of light at near-horizontal directions such as at 80-90 degrees to the light source’s nadir position and choose lanterns which have no emission at these angles as light in these directions is particularly deleterious to the surroundings and propagates into the wider environment, increasing light pollution.
- Installation of LED advertising, particularly large billboards, should be strictly controlled at the planning stage and the environment of the lighting should be considered, e.g. when in proximity to more sensitive areas. As such displays tend to be set for daytime viewing levels, reduction in light output and/or hours of operation should be considered.

Appendix: Additional information

- Further information on desirability of warmer lighting is available on the Dark Sky Ireland site:
  https://www.darksky.ie/wp-content/uploads/2020/04/BestPracticesInPublicLighting_BEspey2020.pdf

- We also recommend adoption of Dark Sky Ireland guidelines available here:
  https://www.darksky.ie/policy/
  https://www.darksky.ie/wp-content/uploads/2019/04/Dark-Sky-Ireland-Policy-Document-2019.pdf

- A document relating to the UK experience in implementing more environmentally-friendly lighting, including safety concerns, is available at:
  https://www.cpre.org.uk/resources/shedding-light/

European Parliament Resolution on Biodiversity:

European Parliament
2019-2024

TEXTS ADOPTED

P9_TA(2021)0277

EU Biodiversity Strategy for 2030: Bringing nature back into our lives

European Parliament resolution of 9 June 2021 on the EU Biodiversity Strategy for 2030: Bringing nature back into our lives (2020/2273(INI))

The sections in this document referencing light pollution are as follows:

AT. whereas light pollution alters the natural night light levels for humans, animals and plants, thus negatively affecting biodiversity by, for example, unbalancing the migratory, nocturnal and reproductive activity of animals, leading also to the loss of insects and pollinators who are fatally drawn to artificial light;

127. Calls on the Commission and the Member States to ensure that the objectives of the Biodiversity Strategy for 2030 are fully reflected in the implementation of the Farm to Fork Strategy, the Chemicals Strategy for Sustainability and in the upcoming zero pollution action plan, which should also address light and noise pollution, including underwater noise; stresses the importance of tackling pollution at source as a priority while ensuring the use of best available technologies;

128. Calls on the Commission to set an ambitious reduction target for 2030 on the use of outdoor artificial light and to propose guidelines on how artificial light at night can be reduced by the Member States;