Assessment of Direct Carbon Emissions for

THELOCOGROUP

LUCHA LOCO

SUPER LOCO ROBERTSON QUAY

SUPER LOCO CUSTOMS HOUSE

By Mark Harding: marknzsurf@gmail.com

Mark Harding: marknzsurf@gmail.com

Introduction:

Mark Harding[1] has undertaken an assessment on behalf of The Loco Group of the total annual direct carbon emissions from three of its restaurants based in Singapore. They are:

1. Lucha Loco (**LL**), 15 Duxton Hill;
2. Super Loco Robertson Quay (**SLRQ**), 60 Robertson Quay; and
3. Super Loco Customs House (**SLCH**), 70 Collyer Quay.

In addition, a forward estimate has been undertaken of total annual carbon emissions for The Loco Group's new store Chico Loco (**CL**) which we understand is to open early 2019.

Carbon Assessment Coverage

This Assessment includes direct carbon emissions from:

- Electricity consumption;
- Natural Gas consumption; and
- Food waste.

The assessment has been based on data supplied from the Loco Group including a year's historical data supplied by The Loco Group[2]. The assessment has been undertaken according to the methodology as set out in Annexure 2.

Assessment Does Not Include Indirect Emission Sources

This assessment does not include any carbon emissions that may arise from indirect sources such as embedded emissions in packaging, in the raising of food, nor from any transportation emissions involved in sourcing food from farm to table. Whilst these are significant and important emission sources, unfortunately accurately quantifying such emissions are much more involved and require significant resources out of the scope of this assessment. It is hoped that these may in the future begin to also be quantified. A cooperative approach between F & B providers would be best here to pool resources and slowly build and create a data base of indirect embedded emission sources which could be available for all Singapore F & B providers.

[1] Bio of Mark Harding is set out in Annexure 1 to this summary report.
[2] Specifically for the year October 2017 to October 2018.

Mark Harding: marknzsurf@gmail.com

Executive Summary – Key Findings

Total Carbon Emissions

- We estimate The Loco Group's (**LG**) current total annual carbon emissions at **385**tCO2e per annum.
- We have estimated LG's new restaurant Chico Loco's (**CL**) total direct annual carbon emissions will be **179** tCO2e per annum. Thus once LG's new restaurant CL opens, LG's estimated total annual direct carbon emissions will become **564** tCO2e per annum.

Existing Restaurant Comparison

- Comparing the different existing restaurants, there are differences in their carbon emissions, however the differences are not significant.
- The restaurants all have very similar emission profiles when we break them down. Direct electricity consumption is by far the most significant source of carbon emissions accounting for over 70% of the carbon emissions in each restaurant, and 75% overall. Food waste is also a material carbon emission source accounting for over 20% of the emissions. Natural Gas is a relatively minor source, only 2-3% in each restaurant.

Areas to Target for Future Reductions

- Overall, converting any of the combi ovens or appliances that use high heat (like dishwashers) to natural gas, or reducing their hours of use will have the biggest impact on reducing electricity consumption as these are by far the most power hungry devices. Secondly any ability to reduce AC use in any way, or make cooling more efficient will also have a significant impact on reducing carbon emissions. Other appliances like fridges and chillers and lighting are more minor consumers of power, reducing their use will still help however their impact will be less.

Purchasing Carbon Offsets to Become Carbon Neutral

- To become "carbon neutral" in relation to its existing direct carbon emissions foot print The Loco Group could purchase 385 carbon credits[3] from a reliable registered carbon credit project that has been certified and verified by a recognized carbon scheme[4]. In the future once Chico Loco comes online we estimate the Loco Group would need to purchase 564 carbon credits in order to be carbon neutral in relation to its direct carbon emissions footprint.

[3] Each carbon credit represents 1tCO2e.

[4] The CDM, (Clean Development Mechanism), VCS (Verified Carbon Standard) and Gold Standard are three recognized reliable carbon certification bodies.

Mark Harding: marknzsurf@gmail.com

CURRENT TOTAL ANNUAL CARBON EMISSIONS

The results are represented visually in *Figures 1 and 2* below which show the total annual carbon emissions for each existing restaurant as well as the LG total combined (Fig 1) and the % breakdown between the 3 emission sources (food waste, gas and electricity) (Fig 2).

Total Carbon Emissions

We estimate The Loco Group's current total annual carbon emissions at **385 tCO2e** per annum[5]. It can be seen that the main sources for LG's carbon emissions are direct electricity consumption (75%) and then food waste (22%). Natural Gas consumption by contrast is a very minor source of carbon emissions (2.9%).

Comparison Between Existing Restaurants

Comparing the different restaurants:

- Whilst there are differences in their total carbon emissions, the differences are not significant. Super Loco Robertson Quay (SLRQ) is the largest carbon emitter producing 165 tCO2e per annum, followed by Super Loco Customs House (SLCH) at 115 tCO2e and Lucha Loco finally at 105 tCO2e.
- The restaurants all have very similar emission profiles when segmented mirroring the total combined profile. Direct electricity consumption is by far the most significant source of carbon emissions. Examining *figure 2* below, we can see that electricity accounts for over 70% of the carbon emissions in each restaurant, and 75% overall. Food waste is also a material carbon emission source accounting for over 20% of the emissions in each restaurant and 22% overall. Finally Natural Gas is a relatively minor source, only 2-3% in each restaurant. As electricity consumption is by far the most significant source of carbon emissions, a further breakdown and analysis is set out in the "Electricity Breakdown" section below.

[5] This combines the total direct emissions from the 3 restaurants, Lucha Loco, Super Loco Customs House and Super Loco Robertson Quay

Fig 1: Graph of Total Annual Carbon Emissions for Each Restaurant and for The Loco Group Combined

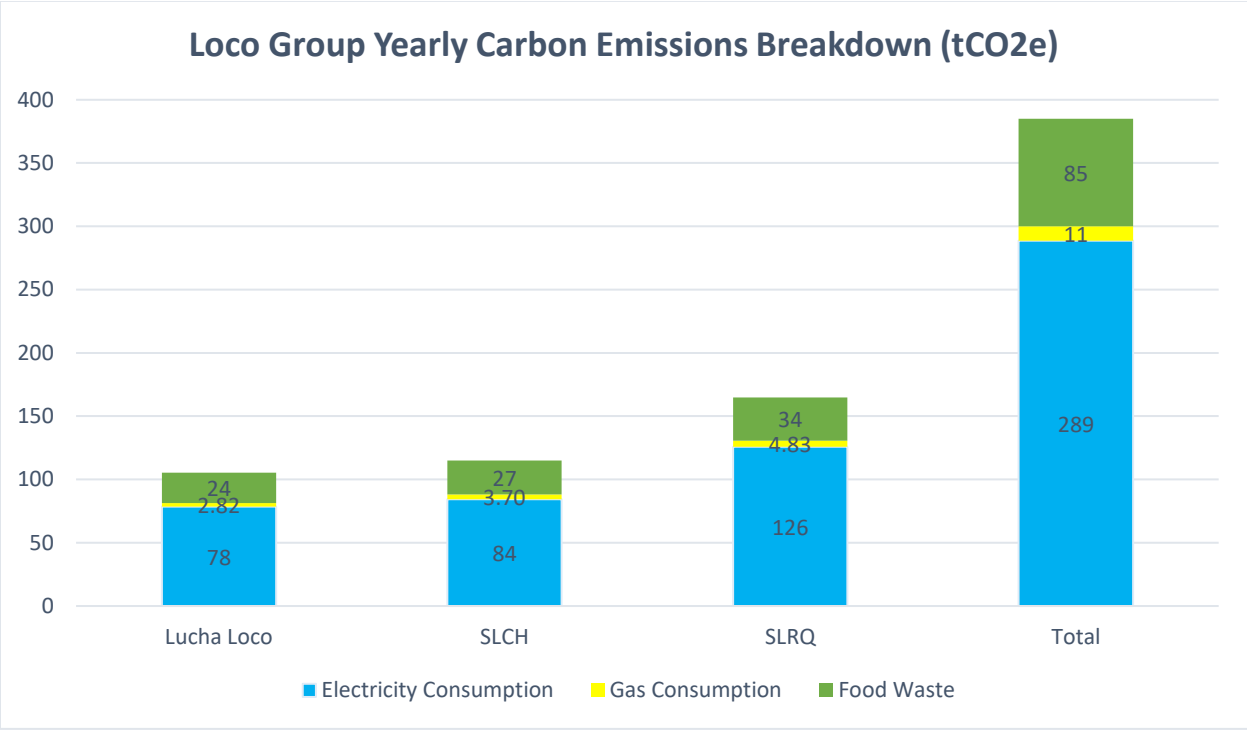
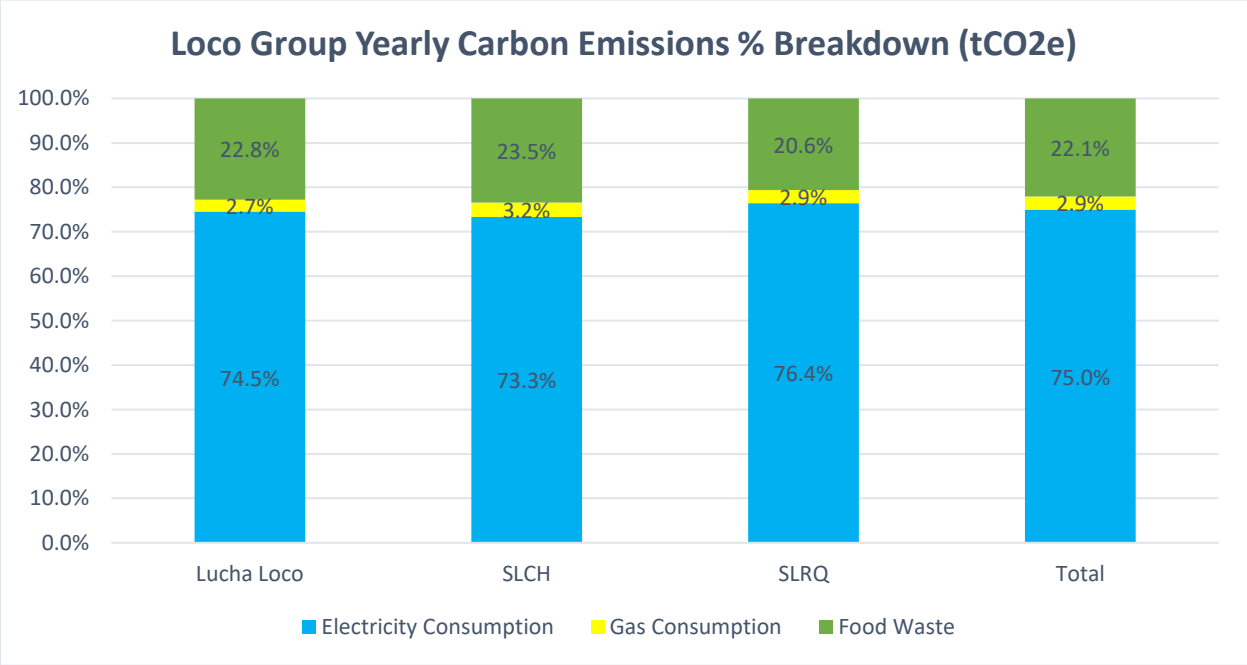


Fig 2: Graph showing % Breakdown for Total Annual Carbon Emissions for The Loco Group



Mark Harding: marknzsurf@gmail.com

Future Estimated Total Carbon Emissions (including Chico Loco (CL))

We estimate that LG's new restaurant Chico Loco's (**CL**) total direct annual carbon emissions will be **179 tCO2e** per annum. Thus once LG's new restaurant CL opens, LG's estimated total annual direct carbon emissions will become **564 tCO2e** per annum.

New Restaurant CL will have largest Carbon Footprint of the LG Group

From our estimations, CL will have the largest carbon footprint of the LG group, larger than that of SLRQ the current largest carbon emitter[6]. A percentage breakdown of CL's carbon footprint is set out in *figure 3* below. CL's carbon emissions also overwhelmingly (over 85%) come from electricity consumption.

Most of the Additional Power Consumption is from AC

Looking at *figure 4* below, we can see that CL's electricity consumption is estimated to come significantly from AC (65%). It is estimated CL's AC will be close to twice as much as any of the other restaurants. Digging into why, the dining area will have one extra AC unit than the other restaurants, but more significantly the type of AC have a much higher rated capacity than the AC units in the other restaurants. This means each AC unit will consume more power per hour of operation than the AC units currently installed in the existing restaurants. Other than AC, CL has an "Eden Walk In chiller" which will consume significantly more power than the other fridges and chillers in the existing restaurants.

Figure 3: Graph showing % Breakdown of Annual Carbon Emissions for Chico Loco

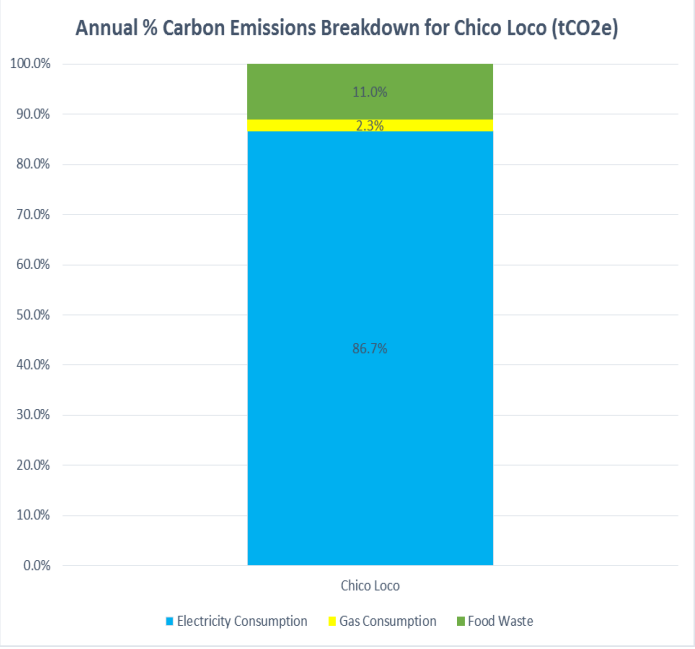
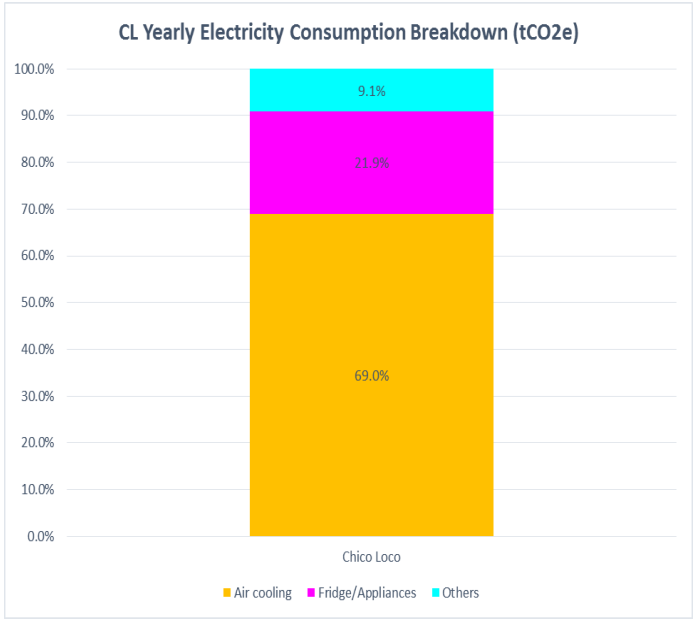


Figure 4: Graph showing % Breakdown of Annual Electricity Consumption for Chico Loco



[6] It is estimated CL will emit 179tCO2e per annum, 14 tCO2e per annum more than SLRQ which emits 165 tCO2e.

The Loco Group Electricity Consumption Breakdown

As direct electricity consumption is by far the major source of direct carbon emissions for all of the restaurants and The Loco Group as a whole, we have attempted to estimate a further breakdown to quantify the major sources which comprise the electricity consumption at each restaurant location. We have broken down electricity consumption into the following 3 subcategories:

1. Air Cooling (AC);
2. Fridges, and specified appliances; and
3. Others.

The Methodology for this estimation is set out Annexure 2. The goal has been to quantify the major sources for electricity consumption which can be useful as The Loco Group look to where they might focus their attention on in the future to make further reductions in their carbon footprint.

How to Use the Electricity Consumption Breakdown Results

As explained in the Methodology section, each restaurant is slightly different in what has been captured within each of the 3 sub categories. For this reason, the electricity breakdown for the total combined restaurants' electricity consumption is not that useful therefore we have not shown this.

Electricity Breakdown is to identify the Major Sources of Consumption within Each Restaurant

The electricity breakdown analysis is useful in examining each restaurant and identifying where their major sources of consumption are. It is also useful in finding general trends between the restaurants, as whilst each restaurant is different in its mix and categorizing of appliances, the same types of appliances that consume a lot of energy show up in each restaurant. The data does a good job of pin pointing where the large electricity consuming sources are which is helpful when examining how to make further reductions.

Figures 5 and 6 below provide a visual breakdown of each restaurant's electricity consumption per annum (fig 5) as well as the percentage of total electricity use segmented between AC, Fridges & Appliances and Others (fig 6).

Figure 5: Graph showing Electricity Consumption Breakdown for Existing LG Restaurants (KWh)

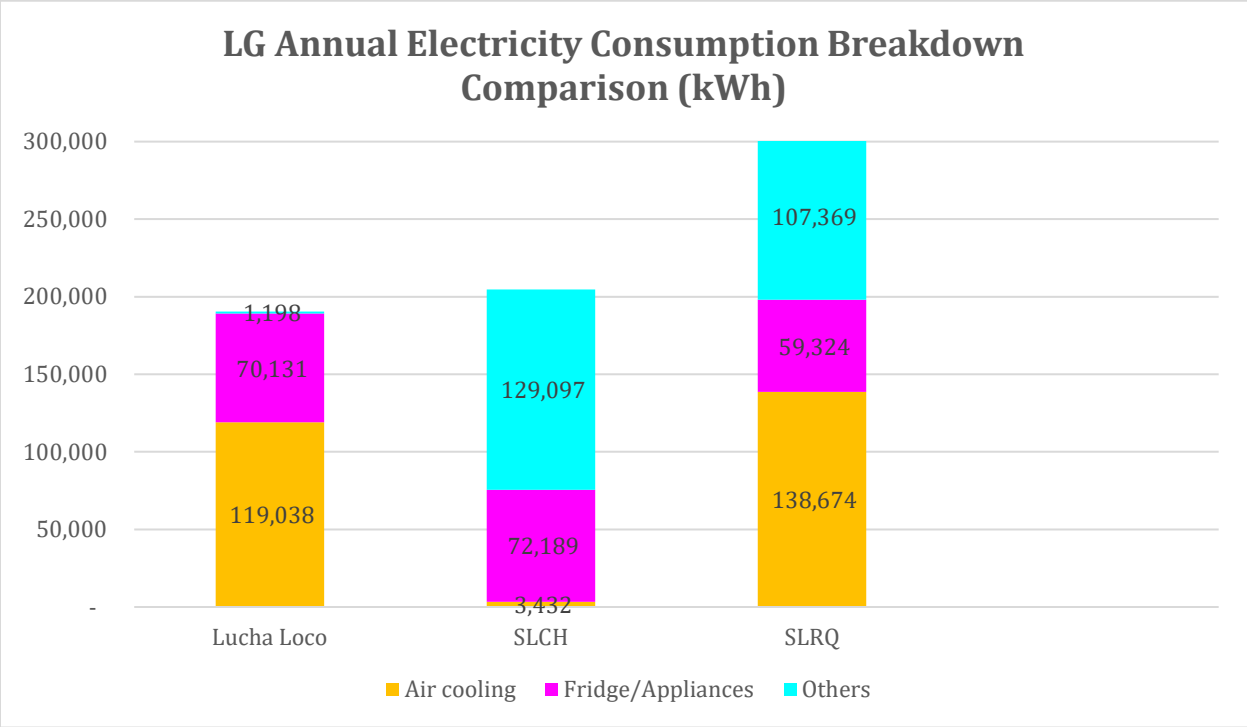
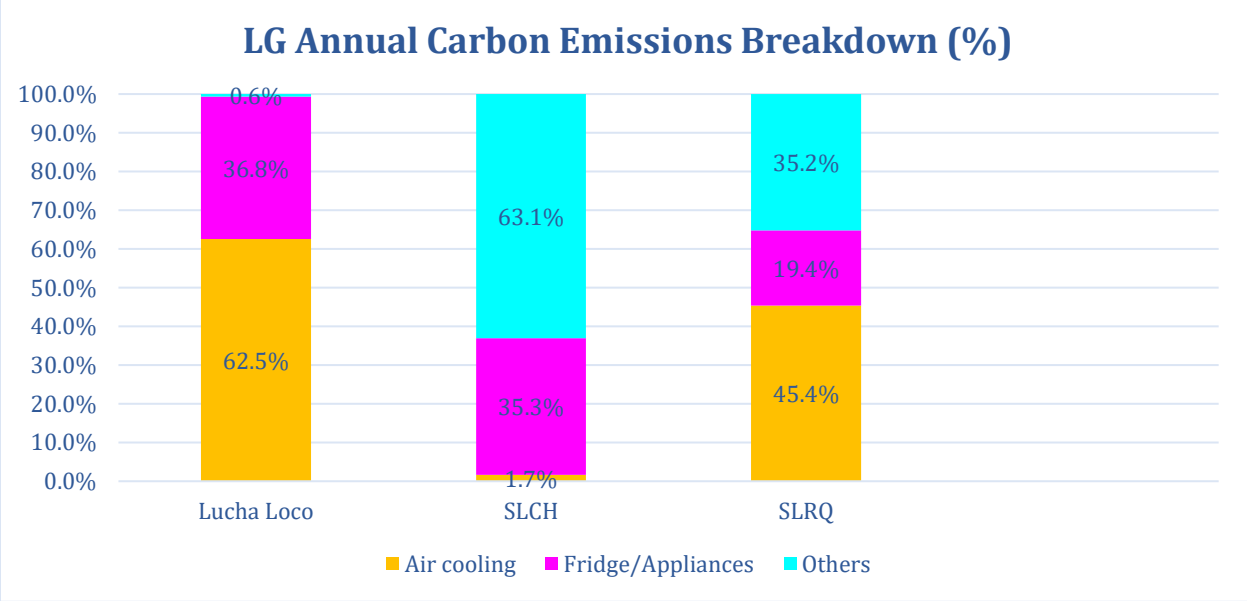


Figure 6: Graph showing % Electricity Consumption Breakdown for Existing LG Restaurants



LG Electricity Consumption Breakdown

From Fig 5, SLRQ has the highest electricity consumption of all the 3 restaurants consuming just over 300,000KWhs of electricity a year. This is materially higher than the 2 other restaurants (approximately 1/3 higher) which are both fairly similar in terms of their power consumption at 204,000 KWhs (SLCH) and 190,000 KWhs (LL) respectively. A brief discussion of each restaurant is set out below.

Super Loco Robertson Quay (SLRQ)

What are the Major Sources of SLRQ's Electricity Consumption?

- AC is the largest consumer of energy for SLRQ (45%) and it is the highest consumer of energy for all of the restaurants (140,000KWhs per annum). With 6 AC units and long hours of use it is expected that Cooling would be a significant source of energy consumption. The "Others" with 35% of total energy consumption is also high and this is discussed below. The Fridges / Appliances category consumes 20% of the electricity consumption. It is interesting to note there that a single combi oven accounts for about 40% of this category's electricity with the rest being made up from an assortment of fridges, chillers and an ice machine[7].

Why is "Others" category so high for SLRQ and SLCH?

- SLRQ and SLCH both consume significant amounts of electricity in the "Others" category[8]. As explained in the Methodology section in Annexure 2, "Others" are unaccounted electricity sources. In this case we have been advised by LG that for both SLRQ and SLCH, the "Others" category contains 2 dishwashing units (a hood type) in the kitchen, and under counter in the bar which are used extensively. Thus SLRQ's and SLCH's "Others" consumption is materially higher than the Fridges / Appliances category because seems that there are some specific appliances in their "Others" category which are a significant source of power consumption.

Super Loco Customs House (SLCH)

Why is SLCH's AC so low?

- The significant difference between SLCH's electricity consumption profile and the other 2 restaurants is that it consumes far less electricity for AC with it accounting for less than 2% of the total power consumption. Why? The answer seems to lie in that the building which SLCH occupies has a central AC system which they pay the landlord separately from their direct energy consumption. Thus their direct cooling is limited to large "blowers" which blow the cool

[7] Note fridges and chillers as they have low capacities are relatively small consumers of power compared to appliances that use electricity to create high heat like dishwashers and ovens especially.

[8] SLCH consumes approximately 130,000 KWhs per annum, whilst SLRQ consumes approximately 107,000KWhs per annum. We note that as SLCH consumes far less power totally than SLRQ, its percentage of Others, is far higher (63% vs 35%).

air out of the centrally cooled system. Therefore SLCH does not have its own air conditioning units such as LL and SLRQ. Assessing SLCH's proportion of carbon emissions from the landlord's central AC system and adding this to its carbon emissions has not been included in this assessment. If this was done, SLCH's total electricity consumption might increase to closer to SLRQs but this depends on the specific central AC system of the building.

SLCH's Others Category Is also very high.

- As discussed above in relation to SLRQ, SLCH has a significant amount of power consumed in the Others category, it accounting for 63% of SLCH's total electricity consumption. We note that this is about 20,000KWhs above SLRQ's. Like SLRQ, extensively used dishwashers will account for a lot of this. The additional amount could also be from us underestimating the amount of energy consumed for the Air Cooling blowers, for which we have estimated based on average ceiling ventilation blowers, not the actual ones in the building the details of which were not known.

Lucha Loco (LL)

AC is the big user

- 62% of LL's electricity consumption comes from AC, with it consuming only 20,000KWhs less per annum in this category than the largest electricity consumer SLRQ. This makes sense as whilst they have comparable hours of operation, LL has AC one unit less than SLRQ.[9] Other than AC, Fridges and specific appliances are a significant user of electricity with it accounting for 36% of LL's electricity. Significantly, more than half of this category's electricity is accounted for by a single combi oven.

Very little "Others"

- Others account for less than 1% of LL's total electricity consumption. This is probably explained by there being no specific high energy high use appliances within this category (ie no dishwashers being constantly used like SLCH and SLRQ). What would be left over would be lighting and small plugged in devices which are relatively minor consumers of power when compared to AC, ovens and large dishwashers.

Focus areas to reduce electricity consumption.

- Overall, Converting any of the combi ovens or appliances that use high heat (like dishwashers) to natural gas, or reducing their hours of use will have the biggest impact on reducing electricity consumption as these are by far the most power hungry devices. Secondly any ability to reduce AC use in any way will also have a significant reduction. Other appliances like fridges and

[9] LL has 5 AC unit whilst SLRQ has 6 and they are of the same type.

chillers and lighting are more minor consumers of power, reducing their use will still help however their impact will be less.

- For AC (LL and SLRQ), power consumption is particularly from AC in the dining area. Any ability to reduce this by making cooling more efficient in the dining area and using passive methods to assist cooling[10] would have a material impact on electricity consumption and thus carbon emissions.

[10] For example any ability to recirculate cold air (or prevent its escape) and shade creating façade or green planting.

ANNEXURE 1: Bio of Mark Harding

Mark Harding LLB(Hons), BSc

Mark has well over a decade of carbon and sustainability experience throughout the Asia Pacific region, and is fluent in spoken Mandarin having lived for 15 years in the Greater China area.

Recently, Mark has been working in Indonesia with a leading Palm Oil producer assisting to design and implement their internal systems to integrate sustainability across their whole organization so they can effectively plan implement, measure, monitor, report and improve sustainability performance across a full spectrum of social and environmental parameters.

Mark has also recently led the successful verification for a UN CDM Programme of Activities for Palm Oil waste Co-composting earning UN Carbon Credits (CERs) for 5 years of monitoring for a specific CDM Program of Activities. This was the first UN CDM Program of activities for co-composting in Indonesia to actually earn carbon credits. Mark was also responsible for the development and registration of this particular CDM Program of Activities 8 years ago including the design and implementation of all management and monitoring systems involved. At that time Mark was the Head of CDM and Sustainability for Carbon Conservation, a Singapore based Carbon Developer and Sustainability Company. Mark built and managed Carbon Conservation's pipeline of CDM projects and advised a number of businesses in the Asia Pacific area on sustainable management issues and strategy addressing carbon, water, waste management, energy and air pollution.

Prior to this Mark established a CDM and carbon project development company in China, where he worked across Asia on a range of CDM and emission reduction projects including demand side efficiency, renewable energy, industrial fuel switching, coal mine methane, biomass and waste water.

Mark worked as a lawyer in Shanghai in a Climate Change, Energy and Resources practice for a large multinational law firm where he was responsible for developing their Greater China climate change and sustainability practice. As well as CDM, Mark advised clients in relation to the establishment and investment into clean energy funds in China, acted as legal counsel for the acquisition of clean energy and technology companies and advised on specific resource and sustainability issues.

Mark also worked as a lawyer for New Zealand's largest law firm, Russell McVeagh where he specialized in environmental, energy and resource management. During this time, he acted for large power generators, and was part of the team for the consenting of a large hydro dam, as well as New Zealand's first wind farm. Mark also advised clients on specific resource and sustainability issues in relation to water, air and waste management.

Mark is a Barrister and Solicitor of the High Courts of New South Wales, Australia and Auckland, New Zealand and holds a law degree with honors (LLB Hons) from the University of Auckland. Mark also has a Bachelor of Science majoring in Biology and Ecology from the University of Auckland.

Annexure 2: Methodology

A single transparent and reliable methodology for assessing direct carbon emissions was not available therefore in this assessment the emissions associated with each major source have been calculated using a different methodology. All methodologies used are approved United Nations Clean Development Mechanism (CDM) methodologies as set out below, and we have followed the calculations and equations as set out in such meths. In particular emissions have been calculated as follows:

Electricity Consumption:

Emissions associated with Electricity consumption have been calculated using:

- *UNFCCC Methodology "Tool to calculate the emission factor for an electricity system"*
- *UNFCCC Methodology AM0029: Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas*

In addition the grid carbon emission factor has been taken from the Singapore Government Energy Market Authority as follows:
https://www.ema.gov.sg/cmsmedia/publications_and_statistics/publications/ses17/publication_singapore_energy_statistics_2017.pdf

Natural Gas Consumption

Emissions associated with Natural Gas consumption have been calculated using:

- *UNFCCC Methodology AMS-I.D.: Grid connected renewable electricity generation*
- *Conversion factor from kwh to M3 have been provided from the gas supplier.*

Food waste

Emissions associated with Food Waste have been calculated using:

- *UNFCCC Approved Methodology AM0025: Alternative waste treatment processes*

Emission calculations are based on estimated food waste quantities provided by The Loco Group and have used the following assumptions

- Food waste is landfilled and will be subject to anaerobic digestion (thus emitting methane); and
- Average annual carbon emissions from food degraded over a 5 year period.

Calculation of forward emissions for Chico Loco

As CL has yet to be opened, there is no existing data available for calculations as there was for the other 3 restaurants. In this case we have estimated CL's carbon emissions based on:

- **Food Waste and Natural Gas**: from project estimates provided by LG; and

- **Electricity Consumption:** based a detailed list of appliances, and estimated daily / weekly usage from LG multiplied by the specific rated capacity for each appliance. Note the final "Others category" was calculated taking the average of the other 3 restaurants for this specific category.

Methodology in Calculating Electricity Consumption Breakdown

The electricity breakdown is only an estimate. The electricity consumption at each restaurant is accurately quantifiable (based on metered utility bills) however there is no separate electricity metering for any specific subcategories of appliances. Thus we have calculated our estimates as follows:

- **AC**: LG have provided a specific list of AC units, and for each an estimate of the daily, and weekly running hours. Based on the specific rated capacity for each unit[11] we can multiply this by the capacity to get a rough estimate of electricity usage.
- **Fridges and other specified appliances:** In addition to the list of AC units, LG has provided us for each location with a specific list of appliances such as fridges, walk in chillers, combi ovens etc that consume electricity and for each an estimate of the daily and weekly running hours. Based on the specific rated capacity for each unit[12] we can multiply this by the capacity to get a rough estimate of electricity usage. We note that for each restaurant the list of these specific appliances differs, as they are each slightly different.
- **Others:** This category is simply a catch all for all the electricity consumption unaccounted for by the first two categories. Thus it is calculated with the following simple formula:
    - **Others = Total Metered Electricity – (AC +Fridges and other appliances).**

  We note that electricity consumption for this "Others" category varies materially between the different restaurants, which is a reflection of the different unaccounted sources at each restaurant.

[11] Please note rated capacities are based on manufacturer's specifications.
[12] Please note rated capacities are based on manufacturer's specifications.