

Rio Environmental Update – 2014

It has been one year since an environmental investigation was undertaken across the four Olympic Zones within the Rio de Janeiro area. After establishing accurate online sources for Zone-specific environmental data, the HPSNZ Physiology Team has been monitoring conditions over the Olympic (5 -21 August, 2014) and Paralympic (7 – 18 September, 2014) periods. Data was collected from three Brazilian Government online sources that were previously verified to have the most accurate and reliable environmental information for each Olympic zone. Weather data was recorded from The Network of Meteorological Aeronautical Command (<http://www.redemet.aer.mil.br>) and The National Institute of Meteorology (<http://www.inmet.gov.br>), while air and water quality data were collected from The State Environmental Institute website (www.inea.rj.gov.br). The following summary includes:

- A comparison of the environmental conditions in 2014 compared to historic data (Table 1).
- The recorded environmental conditions of each Olympic Zone (Copacabana, Barra, Maracana, Deodoro) in 2014 (Table 2).
- A summary of the HPSNZ recommendations for dealing with the Rio environment.

Table 1. Summary of the Rio environmental conditions in 2014 compared to historic data.

| Measure | Historic Norms 2008-2013 | Olympic Period 2013 | | Paralympic Period 2014 | Implications |
|---|---|------------------------|---|---------------------------|---|
| | | 2013 | 2014 | 2014 | |
| Day Time Temperature (°C) | 22-35 | 20-35 | 18-31 | 24-36 | The temperature during the Olympic period in 2014 was slightly lower than historic norms. |
| % Days in Month $\geq 27^{\circ}\text{C}$ | 65% | 52% | 51% | 75% | Temperatures $\geq 27^{\circ}\text{C}$ cause increased physiological strain and can impair performance. |
| Humidity (%) | 40-70 | 39-83 | 40-86 | 29-81 | Humidity decreases during the day (40-70% RH at 22-32°C) and decreases at night (80-100% RH at 14-18°C). The humidity levels during the day in Rio should not impede athlete's cooling ability. |
| Rainfall (mm) | 28 | 20 | 11 | 0 | Predicted to be low during Games' time. |
| Days Raining | 6 | 4 | 4 | 0 | |
| Wind Speed (km/h) | 2-36 (Average = 11) | 2-12 (Average = 9) | 3-25 (Average = 14) | 3-32 (Average = 13) | Wind speed is relatively low in August and September and is predicted to be consistent and stable during Games time. |
| Air Pollution | Pollutant levels (O_3 and PM_{10}) are > NZ healthy standard levels | | Pollutant levels exceeded NZ standards 5-60% of the time depending on the Olympic Zone | | This could impact performance in susceptible athletes in certain events. |
| Water Pollution | Extremely poor compared to NZ standards | | Quality of sea water was reported as 'unsafe for bathing' 0-83% of the time depending on the Olympic Zone | | Increased risk of waterborne-illness and wound infection. It is not expected that water quality will improve dramatically from now to 2016. |

Table 2. Zone specific environmental conditions in 2014.

| Zone | Station | Measure | Unit | Olympic Period 2014 | Paralympic Period 2014 |
|-------------------|------------------------|-------------|------------|------------------------|---------------------------|
| Barra | Jacarepaguá Airport | Temperature | day (°C) | 19-34 | 25-35 |
| | | | night (°C) | 10-18 | 10-20 |
| Copacabana | Fort Copacabana | Temperature | day (°C) | 20-28 | 22-25 |
| | | | night (°C) | 16-23 | 19-23 |
| | | Humidity | (%) | 34-93 | 47-91 |
| | | Wind Speed | (km/h) | 7-36 | 3-25 |
| | | Rainfall | (mm) | 34 | 1 |
| | | | days | 2 | 1 |
| | Marina de Glória | Temperature | day (°C) | 18-29 | 23-33 |
| | | | night (°C) | 11-18 | 12-18 |
| | | Humidity | (%) | 41-89 | 29-81 |
| | | Wind Speed | (km/h) | 0-37 | 6-27 |
| | | Rainfall | (mm) | 6 | 0 |
| | | | days | 3 | 0 |
| Maracanã | Central Rio | Temperature | day (°C) | 19-31 | 24-36 |
| | | | night (°C) | 15-22 | 18-24 |
| | | Humidity | (%) | 40-93 | 29-83 |
| | | Rainfall | (mm) | 10.7 | 0 |
| | | | days | 4 | 0 |
| Deodoro | Military Village | Temperature | day (°C) | 18-31 | 23-35 |
| | | | night (°C) | 13-21 | 13-23 |
| | | Humidity | (%) | 26-91 | 18-88 |
| | | Wind Speed | (km/h) | 0-18 | 7-11 |
| | | Rainfall | (mm) | 20 | 0 |
| | | | days | 3 | 0 |

Note: Not all weather variables were available for each Zone.

HPSNZ Recommendations:

| | |
|---------------------------------------|--|
| Temperature | <ul style="list-style-type: none">▪ <i>Rio can be hot ($\geq 27^{\circ}\text{C}$) which can impair an athletes' performance in some sports.</i><ul style="list-style-type: none">○ Use a heat acclimatisation (before) and cooling (during) strategy.○ Carefully consider pre-Olympic location (similar temp/humidity). |
| Air Quality | <ul style="list-style-type: none">▪ Pollution cannot be adapted to and minimising exposure is the only viable strategy.<ul style="list-style-type: none">○ Limit exposure in and around traffic○ Screen for and manage respiratory conditions (by team physician/physiologist). |
| Water Quality (Tap) | <ul style="list-style-type: none">▪ <i>Currently significant water shortage and tap water contamination</i><ul style="list-style-type: none">○ Only consume sealed bottled water○ Do not drink tap water or restaurant ice○ Strong personal and hand hygiene practices – use sanitised hand wipes○ Avoid swallowing water in showers○ Use bottled water to clean teeth (or boiled water) |
| Water Quality (Open Water) | <ul style="list-style-type: none">▪ <i>> 50% of sewage is untreated causing the contamination of sea/fresh water</i><ul style="list-style-type: none">○ There is a high risk of infection and strategies to reduce this risk will be advised by the HPSNZ Medical Team. |