

Rio Environmental Update – 2015

It has been two years 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 again been monitoring conditions over the Olympic (5 -21 August, 2015) and Paralympic (7 – 18 September, 2015) 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 2015 compared to historic data (Table 1).
- The recorded environmental conditions of each Olympic Zone (Copacabana, Barra, Maracana, Deodoro) in 2015 (Table 2).
- A summary of the HPSNZ recommendations for dealing with the Rio environment.

Table 1. Summary of the Rio environmental conditions in 2015 compared to historic data.

Measure	Historic Norms	Olympic Period		Paralympic Period	Implications
	2008-2013	2014	2015	2015	
Day Time Temperature (°C)	22-35	18-31	20-32	24-37	The temperature during the Olympic period in 2015 was slightly higher than last year and lower than historic norms. It is considerably hotter during the Paralympic period. Temperatures $\geq 27^{\circ}\text{C}$ cause increased physiological strain and can impair performance.
% Days in Month $\geq 27^{\circ}\text{C}$	65%	51%	59%	67%	
Humidity (%)	39-75	40-86	25-77	33-93	Humidity decreases during the day (40-70% RH at 22-32°C) and increases at night (80-100% RH at 14-18°C). The humidity levels during the day in Rio should not impede an athlete's cooling ability.
Rainfall (mm)	28	11	3	50	Predicted to be low during the Olympic Games and may increase during the Paralympic Games.
Days Raining	6	4	1	6	
Wind Speed (km/h)	2-36 (Average = 11)	3-25 (Average = 14)	5-22 (Average = 16)	8-29 (Average = 21)	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	Pollutant levels exceeded NZ standards 12-65% of the time depending on the Olympic Zone. This is ~5% more than last year.			This could impact performance in susceptible athletes (ie, asthma) in certain events.
Water Pollution	Extremely poor compared to NZ standards	Quality of sea water was reported as 'unsafe for bathing' 0-20% of the time in Copacabana and 50-100% along the beaches near Marina de Gloria. The number of unsafe bathing days has increased since last year.			Increased risk of waterborne-illness and wound infection. It is not expected that water quality will improve dramatically for the Games.

Table 2. Zone specific environmental conditions in 2015.

Zone	Station	Measure	Unit	Olympic Period 2015	Paralympic Period 2015
Barra	Jacarepaguá Airport	Temperature	day (°C)	25 - 32	19 - 37
			night (°C)	19 - 22	17 - 26
		Humidity	(%)	40-66	33 - 83
Copacabana	Fort Copacabana	Temperature	day (°C)	20 - 29	17 - 36
			night (°C)	17 - 24	17 - 23
		Humidity	(%)	43 - 77	33 - 93
		Wind Speed	(km/h)	7 - 43	11 - 29
		Rainfall	(mm)	3	64
			days	1	5
	Marina de Gloria	Temperature	day (°C)	24 - 30	19 - 36
			night (°C)	18 - 21	17 - 22
		Humidity	(%)	38 - 63	32 - 88
		Wind Speed	(km/h)	7-29	6 - 28
		Rainfall	(mm)	0.4	19
			days	1	4
Maracanã	Central Rio	Temperature	day (°C)	24 - 32	18 - 37
			night (°C)	20 - 25	18 - 28
		Humidity	(%)	55 - 77	25 - 93
		Rainfall	(mm)	0	59
			days	0	7
Deodoro	Military Village	Temperature	day (°C)	23 - 32	18 - 39
			night (°C)	15 - 22	17 - 22
		Humidity	(%)	25 - 59	18 - 88
		Wind Speed	(km/h)	7 - 18	7- 29
		Rainfall	(mm)	0	56
			days	0	6

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

HPSNZ Recommendations:

Temperature	<ul style="list-style-type: none">▪ <i>Rio more often than not will be hot ($\geq 27^{\circ}\text{C}$).</i>▪ <i>Heat can impair an athletes' performance.</i><ul style="list-style-type: none">○ Use a heat acclimatisation (before) and cooling (during) strategy.○ Carefully consider your pre-Olympic location (similar temp/humidity).
Air Quality	<ul style="list-style-type: none">▪ Pollution cannot be adapted to, so minimising exposure is the only viable strategy.<ul style="list-style-type: none">○ Limit exposure in and around traffic (avoidance and air conditioned car)○ 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○ Diligent personal and hand hygiene practices – use sanitised hand wipes○ Avoid swallowing water in the shower○ 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 in open water and strategies to reduce this risk will be advised by your HPSNZ Medical Team.